

# TECHNICAL REPORT

## ANALYSIS OF AIRCRAFT EXHAUST EMISSION MEASUREMENTS

By: Leonard Bogdan and H.T. McAdams

**CAL No. NA-5007-K-1**

Prepared For:

ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF EMISSION CONTROL TECHNOLOGY  
CHARACTERIZATION & CONTROL DEVELOPMENT BRANCH  
ANN ARBOR, MICHIGAN 48103

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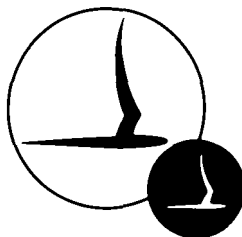
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**CORNELL AERONAUTICAL LABORATORY, INC.**

OF CORNELL UNIVERSITY, BUFFALO, N. Y. 14221

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TABLE OF CONTENTS  
ANALYSIS OF AIRCRAFT EXHAUST EMISSION MEASUREMENTS

|        |                                                                                 | <u>Page</u> |
|--------|---------------------------------------------------------------------------------|-------------|
|        | FOREWORD. . . . .                                                               | iii         |
|        | ACKNOWLEDGEMENT . . . . .                                                       | iv          |
|        | ABSTRACT. . . . .                                                               | v           |
|        | LIST OF SYMBOLS . . . . .                                                       | vi          |
| Part 1 | TECHNICAL REPORT. . . . .                                                       | 1-1         |
|        | 1.1 Introduction . . . . .                                                      | 1-2         |
|        | 1.2 Methodology of Data Analysis . . . . .                                      | 1-3         |
|        | 1.2.1 General Comments. . . . .                                                 | 1-3         |
|        | 1.2.2 Detailed Procedure. . . . .                                               | 1-4         |
|        | 1.3 Statistical Analysis . . . . .                                              | 1-21        |
|        | 1.4 Presentation of Results. . . . .                                            | 1-22        |
|        | 1.5 Discussion . . . . .                                                        | 1-25        |
|        | 1.6 Summary . . . . .                                                           | 1-32        |
|        | 1.7 References . . . . .                                                        | 1-33        |
|        | Appendix A - Span-Gas Checks of Test Organizations'<br>Instrumentation. . . . . | A-1         |
| Part 2 | SUMMARY OF DATA . . . . .                                                       | 2-1         |
|        | 2.1 Data Treatment and Commentary. . . . .                                      | 2-2         |
|        | 2.1.1 Piston Engines. . . . .                                                   | 2-2         |
|        | 2.1.1.1 Scott Research Laboratories. . . . .                                    | 2-2         |
|        | 2.1.1.2 Teledyne Continental Motors. . . . .                                    | 2-4         |
|        | 2.1.2 Auxiliary Power Units - AiResearch. . . . .                               | 2-6         |
|        | 2.1.3 Turbine/Turboprop Engines . . . . .                                       | 2-8         |
|        | 2.2 Tabulated Results. . . . .                                                  | 2-12        |
|        | Table I Piston Engines (Scott) . . . . .                                        | I-1         |
|        | Table II Piston Engines (Continental) . . . . .                                 | II-1        |
|        | Table III Auxiliary Power Units (AiResearch) . . . . .                          | III-1       |
|        | Table IV Turbine/Turboprop Engines. . . . .                                     | IV-1        |
|        | Table V Reprocessed Data . . . . .                                              | V-1         |

## FOREWORD

This report was prepared by Cornell Aeronautical Laboratory, Inc. (CAL), Buffalo, New York under Environmental Protection Agency (EPA) Contract No. 68-04-0040. The work was administered under the direction of the Office of Air Programs, Characterization & Control Development Branch, Division of Emission Control Technology, Mr. Barry D. McNutt, Project Officer.

This is the Phase I Technical Report that describes and summarizes the results of studies conducted during the period from June 1971 through September 1971 to translate field-measurement data on aircraft engine emissions into a format useful for the promulgation of realistic standards. The basic input data were supplied by the EPA.

The effort was performed jointly by the Vehicle Research Department and the Systems Research Department of CAL. Acknowledgement is made of the significant technical contributions to the program by P. A. Reese and G. D. Higgins who were responsible for computer programming. A special note of acknowledgement is in order for Mrs. A. Guendel, Mrs. S. J. Sweet and Mr. J. E. Blickenstaff who so ably performed the operational functions of data logging and transcription, curve fairing and related tasks. R. A. Grom and his staff merit recognition for prompt and efficient response to digitization requirements in the context of meeting crucial program deadlines.

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## ABSTRACT

An account is presented of the analytical procedures and data processing techniques employed in translating field-measurement data of aircraft exhaust emissions into a form consistent with the needs for the promulgation of realistic standards. Pollutant mass emissions for carbon monoxide (CO) hydrocarbons (HC) and the oxides of nitrogen ( $\text{NO}_x$ ) are computed for an aircraft operational cycle comprised of the following modes: taxi/idle, take-off, climb out and approach. The calculations are for specific engine power (or thrust) settings for each mode as well as for specified times in mode. Numerical results are tabulated for each individual engine tested together with summaries obtained by aggregating engine data on a model basis. Data are presented for turboprop/turbine engines, light-utility piston engines and auxiliary power units.

## LIST OF SYMBOLS<sup>\*</sup>

|          |   |                                                |
|----------|---|------------------------------------------------|
| $CO$     | = | concentration of CO in exhaust, ppm            |
| $CO_2$   | = | concentration of $CO_2$ in exhaust, o/o        |
| $F$      | = | mass rate of fuel flow, lb/hr                  |
| $HC$     | = | concentration of hydrocarbons in exhaust, ppmC |
| $M_x$    | = | molecular weight of "x" ( $M_H = 1.008$ )      |
| $NO$     | = | concentration of NO in exhaust, ppm            |
| $NO_2$   | = | concentration of $NO_2$ in exhaust, ppm        |
| $NO_x$   | = | concentration of NO + $NO_2$ in exhaust, ppm   |
| $w_x$    | = | mass emission rate of component "x", lb/hr     |
| $\alpha$ | = | atomic hydrogen-carbon ratio of fuel           |

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<sup>\*</sup>As used in equations in test of Part 1 of this report unless otherwise noted in the context.

**Part 1**  
**TECHNICAL REPORT**

## 1.1 INTRODUCTION

The constituent components of the exhaust emissions resulting from aircraft operations include the same pollutants produced by highway vehicular traffic as well as certain other sources of pollutants, and thus play a similar role in the general air pollution problems. While aircraft exhaust emissions presently are considered to constitute a small portion of the total atmospheric pollution burden of a community (Ref. 1), the relative proportion of this burden is expected to increase in the future because of (a) the continuing development of technology for successfully decreasing emissions from highway vehicles and (b) the anticipated growth in the number of aircraft and aircraft operations in the next decade. It is the more tangible evidence of the aircraft emissions in the form of smoke and odors that has generated a reaction from the public. That aircraft exhaust emissions constitute a segment of the general air pollution problem that warrants a technically-based assessment is manifest.

Recognition of the dimensions of these problems at the federal level of government is reflected by the passage of an Act cited as the "Clear Air Amendments of 1970". This act specifically directed the initiation of a study to determine the effects of aircraft emissions on air quality, the technological feasibility of controlling such emissions and, finally, the issuance of proposed emission standards. In compliance with the last of these directives, the EPA instituted a broadly-based experimental program to measure the exhaust emissions from aircraft engines currently used in the commercial, military and general aviation sectors that comprise the aviation scene within the country. Auxiliary power units (APU) were also included within the scope of this effort. These basic or "raw" measurements consisted of data on emission concentrations together with pertinent information on engine maintenance history, engine settings and ambient conditions during test. These data were forwarded to CAL for processing and analysis directed to the ultimate objective of producing a statistical format conducive to the promulgation of realistic standards. Numerical specifications for typical operational

landing-take-off (LTO) cycles for the various model engines were provided by the EPA.

Part 1 of this report discusses the methodology adopted at CAL for processing the input data and presents the rationale underlying the selection of the specific analytical procedures. The objective was to generate an output in the form of a set of best estimates, comprising a mean value supplemented by a measure of statistical dispersion, for emissions for specific engines, specific categories of operational modes and other applicable constraints. The end purpose of this analysis was the establishment of a rational basis for specifying engine exhaust emission standards. An additional objective involved the identification and possible isolation of the sources of variability in engine emissions and, to the maximum extent possible with the available data, the appraisal of the relative importance of the sources. Results of these latter studies will be incorporated in a separate report to be published during November 1971.

Summaries of the numerical data and the results obtained for light-utility piston engines, auxiliary power units and turboprop/turbine engines are included in Part 2. Because each of these engine categories required a unique analytical procedure in data treatment, a brief description of these procedures, together with pertinent observations, precedes the set of data sheets.

The test data presented represent a complete inventory of all of the pertinent information received by CAL.

## 1.2 METHODOLOGY OF DATA ANALYSIS

### 1.2.1 General Comments

The specific methods and details pertinent to the data processing and the analytical procedures that are described constitute an attempt to best adjust the methodology to the ultimate objectives and the nature of the input

data supplied for processing. In this respect a learning cycle was involved with the methodology subject to adjustment as the results from the processing of the initial quantities of test data were assessed (the field data were received at CAL in a piecemeal fashion). The unique flexibility and advantages realized by virtue of those methods ultimately selected is made apparent in the succeeding discussion.

For reasons that will be clarified later, different methodologies for data analysis were required for each of the following categories of engines: (a) thrust turbines and turboprops, (b) piston engines and (c) auxiliary power units. Even within these general categories there were further variations in the manner of processing as dictated by the type of data which were provided. All of these factors are discussed in detail in their appropriate places in this report. Because of the high level of interest of the EPA in the commercial thrust turbines and turboprops, this engine category was the object of the most extensive data processing. Also, the major portion of all tests submitted for analysis were in this category. For example, this report contains data on a total of 392 engine tests comprised of 199 turbine/turboprop tests, 140 piston engine tests and 53 tests on APU's.

A concise overview of the entire set of operations comprising data processing and analysis is obtained by reference to the flow chart of Figure 1. In its entirety, this flow chart is applicable only to the analysis performed upon data for turboprop and turbine (commercial) engines. Certain portions of the flow chart operations were common to other engine categories as well (for example, data for all categories of engines was at least coded and keypunched). The following descriptive summary faithfully follows the sequence of the flow chart.

#### 1.2.2 Detailed Procedures

##### Editing

Upon arrival at CAL, the primary data sheets were logged and examined for completeness of information, consistency of parameter dimensions and

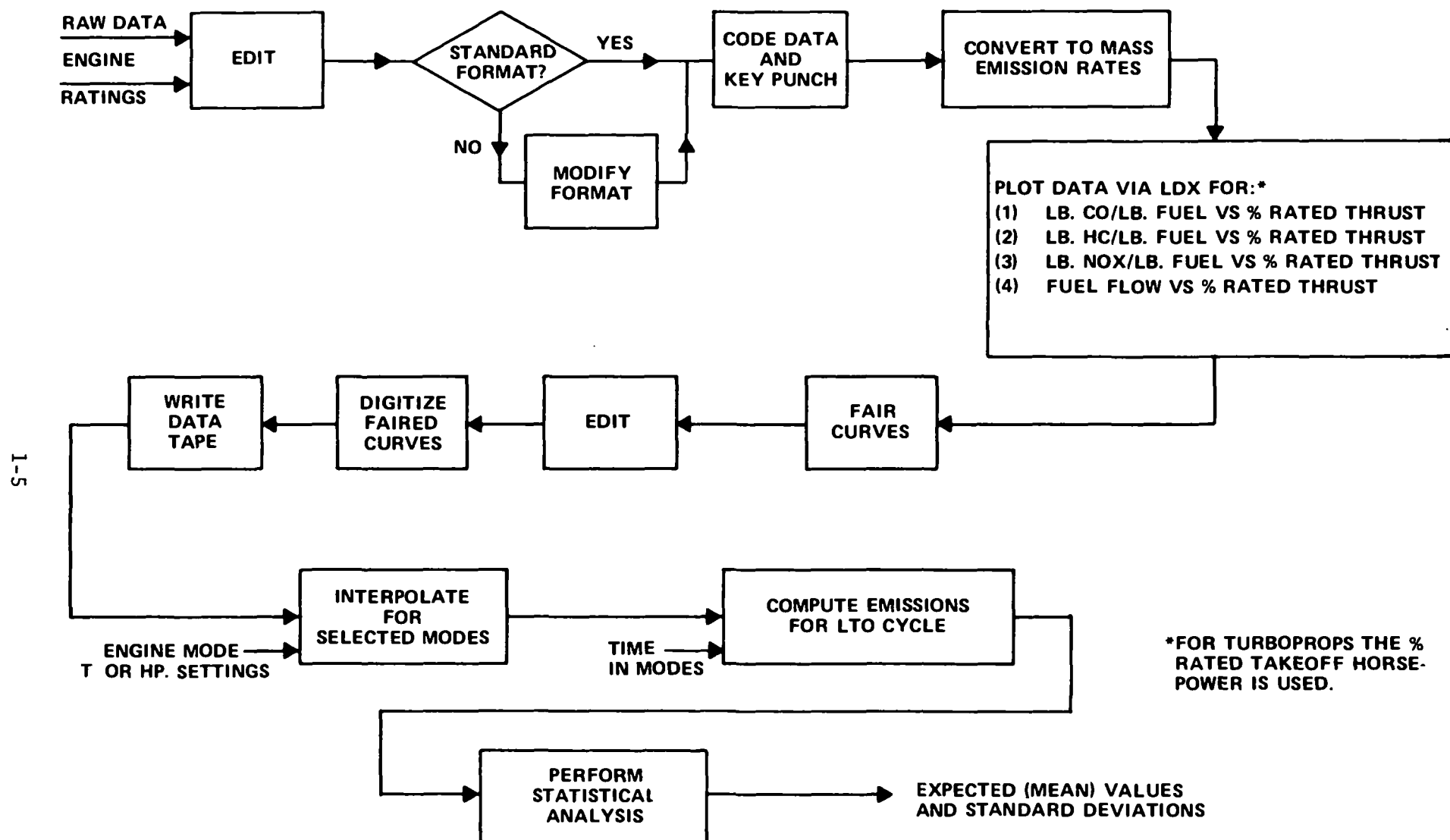


Figure 1 FLOW CHART – DATA PROCESSING AND ANALYSIS – TURBINE AND TURBOPROP ENGINES

reasonableness of the data. Where feasible, the necessary dimensional conversions and calculations were made; otherwise, missing information was obtained, if possible, by contacting the testing organization. A complete listing of testing organizations, the geographical location of the respective test sites and the types of engines tested at each is shown in Table 1.

At this stage of the process the rated take-off power or thrust setting for each engine was entered since, as will be demonstrated, this parameter represents the common base against which the exhaust emissions and engine fuel flow were plotted.

#### Format

As shown in the flow chart, the primary data supplied by the various test organizations were to have been presented in a standard format devised by the EPA. Standard format sheets for the turbine engines and piston engines are shown in Figures 2 and 3 respectively. In the majority of the cases, however, the data received departed in varying degrees from the standard sheet, both in format and in the actual data content supplied. For example, relevant information such as engine history data, data on ambient conditions and pollutant emissions often were lacking. Most troublesome of all were those numerous cases in which certain elements of information essential to data reduction and analysis were missing. As an example, thrust data was not always given for all test modes, and in some cases, CO<sub>2</sub> concentrations were not recorded. In addition, there were inconsistencies in the basis of reporting pollutant concentrations, whether wet or dry basis, whether hydrocarbons were recorded as methane or as carbon, and whether all units of measurement were consistent throughout. A significant amount of time and effort was consumed, therefore, in editing the received data, in attempting to retrieve missing information, and in modifying the format to a sufficient extent to make it compatible with established processing procedures.\* In many cases, such

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\* Keypunch operators had been pre-trained to work directly from data entered on the standard format sheets.

**Table 1**  
**SUMMARY OF SOURCES OF EMISSIONS MEASUREMENTS**

| TEST ORGANIZATION            | TEST SITE                                                        | TYPE ENGINES TESTED                                                          | TYPE EMISSION MEASUREMENT                               |
|------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------|
| PRATT AND WHITNEY AIRCRAFT   | E. HARTFORD, CONN.                                               | JT3D, JT8D, JT9D - TURBINES<br>(EXPERIMENTAL AND PRODUCTION TYPES)           | ALL EMISSIONS - WET                                     |
| DETROIT DIESEL ALLISON DIV.  | INDIANAPOLIS, IND.                                               | T56 (PRODUCTION TYPES) -<br>TURBOPROPS                                       | CO, CO <sub>2</sub> , NO <sub>x</sub> - DRY<br>HC - WET |
| TELEDYNE-CONTINENTAL         | MUSKEGON, MICH.                                                  | LIGHT UTILITY, GENERAL<br>AVIATION - PISTON                                  | CO, NO - DRY<br>HC - WET                                |
| AIRESEARCH                   | PHOENIX, ARIZ.                                                   | AUXILIARY AND SMALL<br>PROPULSION UNITS                                      | ALL EMISSIONS - WET                                     |
| BUREAU OF MINES              | AMERICAN AIRLINES MAINTENANCE<br>AND ENG'RG. CENTER TULSA, OKLA. | JT3D, JT8D, R-R SPEY -<br>TURBINES                                           | ALL EMISSIONS - WET                                     |
| EPA TEAM                     | UNITED AIRLINES<br>SAN FRANCISCO, CALIF.                         | JT3C, JT3D, JT4A, JT8D -<br>TURBINES                                         | ALL EMISSIONS - WET                                     |
| SOUTHWEST RESEARCH INSTITUTE | KELLY AFB, TEXAS<br>TWA, KANSAS CITY, MO.                        | T56 - TURBOPROPS, J79 -<br>TURBINES<br>JT4A, JT3D, JT8D, CJ805 -<br>TURBINES | ALL EMISSIONS - WET<br>ALL EMISSIONS - WET              |
| SCOTT RESEARCH LABORATORIES  | NORFOLK, NAS, VA.<br>GENERAL AVIATION AIRPORTS                   | J52, J57, TF30 - TURBINES<br>LIGHT UTILITY - PISTON                          | ALL EMISSIONS - DRY<br>ALL EMISSIONS - DRY              |

**Figure 2 a**  
**AIRCRAFT EMISSIONS BASELINE DATA SHEET**

Date: \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_ Sheets

Test Organization \_\_\_\_\_

Engine Supplier \_\_\_\_\_

Individual in Charge \_\_\_\_\_

Engine Data:

Engine Serial No. \* \_\_\_\_\_ Engine Type and Model \_\_\_\_\_

Engine Total Time, hrs. \_\_\_\_\_

"Time Since Hot Section Overhaul," hrs. \*\* \_\_\_\_\_

Time Since:

N<sub>1</sub> Compressor Overhaul, hrs. \_\_\_\_\_, N<sub>2</sub> Compressor Overhaul, hrs. \_\_\_\_\_,

Combustor Can Replacement, hrs., (indicate part number) \_\_\_\_\_, First Stage Nozzle Guide Vane

Overhaul, hrs. \_\_\_\_\_, N<sub>1</sub> Turbine Overhaul, hrs. \_\_\_\_\_, N<sub>2</sub> Turbine

Overhaul, hrs. \_\_\_\_\_

Fuel \_\_\_\_\_ Fuel H/C Ratio \_\_\_\_\_

Operational Data:

Inlet Air Temperature, °F: Start \_\_\_\_\_, Finish \_\_\_\_\_

Atmospheric Pressure: Start \_\_\_\_\_, Finish \_\_\_\_\_

Inlet Air Humidity, lbs, H<sub>2</sub>O/lb. dry air \_\_\_\_\_

Relative Humidity \_\_\_\_\_

Sample Line: Temperature, °C \_\_\_\_\_, Flow rate, liters/min \_\_\_\_\_

Sample Line Transport Time, sec. \_\_\_\_\_

\*Attach engine history sheet as appropriate.

\*\*A.A. – Time Since Hot Section Inspection, TWA – Time Since Hot Section Maintenance,  
U.A. – Time Since Engine Heavy Maintenance, also may refer to time since hot section was  
brought to "zero" time; give your interpretation of your entry as necessary.

Comments:

**Figure 2 b**

[illegible]

**Figure 2 c**

[illegible]

**Figure 3 a**  
**AIRCRAFT EMISSIONS BASELINE DATA – PISTON ENGINES**

Date: \_\_\_\_\_ Sheet No. \_\_\_\_\_ of \_\_\_\_\_ Sheets

Test Organization \_\_\_\_\_

Engine Supplier \_\_\_\_\_

Individual in Charge \_\_\_\_\_

Engine Serial No.\* \_\_\_\_\_ Engine Type and Model \_\_\_\_\_

Engine Total Time, hrs. \_\_\_\_\_ Time Since Last Engine Overhaul, hrs. \_\_\_\_\_

Fuel \_\_\_\_\_

Inlet Air Temperature, °F: Start \_\_\_\_\_, Finish \_\_\_\_\_

Atmospheric Pressure: Start \_\_\_\_\_, Finish \_\_\_\_\_

Inlet Air Humidity, lbs. H<sub>2</sub>O/lb. dry air \_\_\_\_\_

Relative Humidity \_\_\_\_\_

Sample Line: Temperature, °C \_\_\_\_\_ Flow Rate, liters/min \_\_\_\_\_

Sample Line: Transport Time, sec. \_\_\_\_\_

\*Attach engine history sheet as appropriate.

Comments:

**Figure 3 b**

[illegible]

modification was not possible; a complete transcription of the data into standard sheets was necessitated.

### Coding and Key Punching

Once the data were edited to a sufficient extent to be useable in the analysis process, these data had to be coded and key punched for entry into subsequent computer processing. Coding consisted of such matters as assigning serial numbers to engine models, fuel types, testing organizations and engine suppliers by which they could subsequently be identified, identifying the various pollutants by an appropriate code, and assigning a sequence of numbers to the various power settings in a test in such a way that the several test points could retain their time sequence identity in subsequent processing. In addition pertinent comments related to the particular test (such as presence of retrofits on the engine, use of fuel additive, unusual test problems, etc.) were encoded. The data was then key punched in a format which allowed retrieval of substantially all the information received from any one test organization.

### Conversion of the Data

As seen by reference to the data sheets shown in Figures 2 and 3, all of the pollutant emissions were given in terms of concentrations, either as parts per million by volume or as a percentage volume. A more useful and meaningful quantity for data analysis is the mass emission rate of the pollutant.

Equations for converting concentration data into mass emissions data were derived from the basic chemical equation for the combustion of a hydrocarbon fuel in air. The details of this derivation will not be included in this report. Instead, only the final conversion formulae will be documented with the observation that they are in general accord with those given in Ref. 2. The pertinent equations are listed below:

$$w_{CO} = \frac{M_{CO} \frac{CO}{10^4} F}{(M_C + \alpha M_H) \left( \frac{CO}{10^4} + CO_2 + \frac{HC}{10^4} \right)} \quad (1)$$

$$w_{HC} = \frac{M_{HC}^* \frac{HC}{10^4} F}{(M_C + \alpha M_H) \left( \frac{CO}{10^4} + CO_2 + \frac{HC}{10^4} \right)} \quad (2)$$

$$w_{NO_x} = \frac{M_{NO_x} \frac{NO_x}{10^4} F}{(M_C + \alpha M_H) \left( \frac{CO}{10^4} + CO_2 + \frac{HC}{10^4} \right)} \quad (3)$$

$$w_{CO_2} = \frac{M_{CO_2} CO_2 F}{(M_C + \alpha M_H) \left( \frac{CO}{10^4} + CO_2 + \frac{HC}{10^4} \right)} \quad (4)$$

The above equations were programmed for the IBM 370/165 computer to perform the data conversion. To utilize these particular equations, the emission concentrations must be expressed on a wet (or actual) concentration basis. Since some of the input data received were measured on a dry basis (see Table 1 for details), appropriate corrections to these data were necessary. Correction simply involves the multiplication of the dry concentration data by a correction factor to obtain the required wet concentration data. The appropriate equations that define the correction factors are listed below:

- a. CO and CO<sub>2</sub> are measured on a wet basis, NO on a dry basis and NO to be converted to a wet basis  
(K = correction factor)

$$K = \frac{100 - \frac{\alpha}{2} \left( \frac{CO}{10^4} + CO_2 \right)}{100} \quad (5)$$

---

\* In this report the hydrocarbon mass emissions are always given in terms of methane,  $M_{HC} = 16.04$ .

- b. All measurements are on a dry basis

$$K = \frac{100}{100 + \frac{\alpha}{2} \left( \frac{CO}{10^4} + CO_2 \right)} \quad (6)$$

In both cases, the correction is for the water of combustion.

One observation common to all of the preceding equations is that the carbon dioxide component is overwhelmingly dominant in terms of the concentrations and mass rate emissions among all the effluents.

#### Data Plotting

Following the conversion of CO, HC and NO<sub>x</sub> concentration data to mass emission rates, a set of four plots was made for each turbine and turbo-prop engine tested by means of Long Distance Xerography (LDX).

The Xerox LDX plotter is basically a combination of the Xerox process (light-sensitive electrostatic drum) and a flying-spot scanner. The beam of the cathode-ray tube in the LDX plotter has discrete beam locations addressable in two coordinates. The output of the plotter is recorded on paper strip 8-1/2 inches wide. The usable width for recording purposes is 7.82 inches. This width accommodates 1024 discrete addressable locations separated by 1/131 inch. Along the length of the paper strip, the same distance between addressable locations applies, but recording can be carried out continuously up to a total length of 2000 feet, the length of the roll of paper. In practice, the paper is usually cut into 11-inch lengths to provide standard-sized 8-1/2 inch by 11-inch sheets. For present purposes it was found convenient to use a standard 5-inch by 5-inch plot and to scale the data in such a way as to conform to this standard format. For thrust-rated engines, each measured thrust value in the test was expressed as a percentage of the take-off thrust rating for the engine, and these normalized thrust

values were used as the abscissae for the LDX plots. Three of the plots in the series employed pounds of pollutant per thousand pounds fuel as ordinates. The other one showed the relation between thrust and fuel flow. By means of the LDX process, the points were plotted and displayed very rapidly. Continuous curves were faired (manually) to these points for subsequent interpolative use. One major advantage of this approach was that the plots made evident any discrepancies in the data and thus introduced an additional control on the quality of the data included in the final analysis of emissions. This approach also provided a means whereby engineering judgment could be brought to bear on the problem, especially where data were sparse in some regions of the curve. Purely analytical methods such as least-squares curve fitting would not have permitted this interpretive process.

#### Curve Fairing

Fairing of the LDX plots was purely a manual procedure. The normal process involved a visual scanning of a large quantity of plots for a given type engine to help define the general shape of the various curves. This knowledge proved useful in the fairing process in those test situations where data points were sparse, missing or poorly spaced. The plots for HC and CO generally approximate an equilateral hyperbola with a sharp "knee" just above the idle/taxi thrust settings. Unfortunately much of the initial test data obtained had very few points in this critical region in the 10% to 30% range of rated power or thrust.\* By relying on data from those test runs where adequate data were available to reliably define the shape of the entire curve, it was possible to fair (and use) the data from tests where a poor spacing of the data points existed. In addition, random data points widely divergent from the normal trend of the bulk of the data were excluded by the fairing process. These points were first checked to ascertain they were not influenced by an processing errors.

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\* This information was relayed later to the EPA who in turn requested the test organizations to take measurements in this region of power settings. Accordingly some of the later data received provided LDX plots that were very well defined in all regions of the curve.

### Digitizing of the Faired Curves

With the fairing of curves to the points plotted by LDX, a means was available for interpolating emission rates for any desired thrust ratio. Also by virtue of the fuel flow versus thrust curve, pounds of emission per pound of fuel could be converted to pounds of pollutant per hour for each of the interpolated points. In order to extract these quantities from the curves, however, it was necessary to read the curves for each desired input datum.

At this point in the analysis, several options were available. The curves could have been read, for example, with or without mechanical aids; moreover, the curves could have been read only at those values of thrust or power associated with a particular operational mode, or they could have been read at a number of points in consideration of any future changes in the definition of the operating modes. In the interest of flexibility, it was decided that the curves should be read at a sufficient number of points to permit them to be approximated by connecting straight-line segments. Accordingly, for the CO, HC and NO<sub>x</sub> curves, twelve points were read from each of the faired curves. These points were closely spaced in regions of the curve exhibiting high curvature and spaced relatively far apart in regions of the curve which were approximately linear. Because the fuel flow vs thrust curves were monotonic and exhibited relatively little curvature, it was concluded that they could be well approximated by fewer straight-line segments. Hence these curves were only read at five points. Samples of the faired LDX plots showing the points at which the curves were read are shown in Figure 4. These figures represent a complete set of plots for a test run identified as CAL ID No. 393. The alphabetical sequence of the letters (and progression of other symbols) preserves the original chronological order in which the test points were taken. Precise location of the original data point input represented by each letter (or symbol) is at the lower left-hand corner of the symbol in each instance.

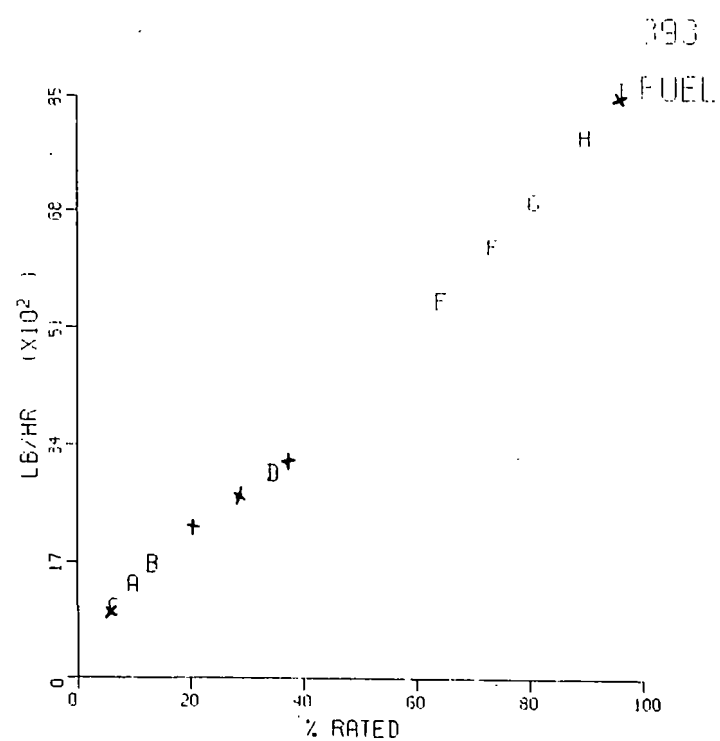
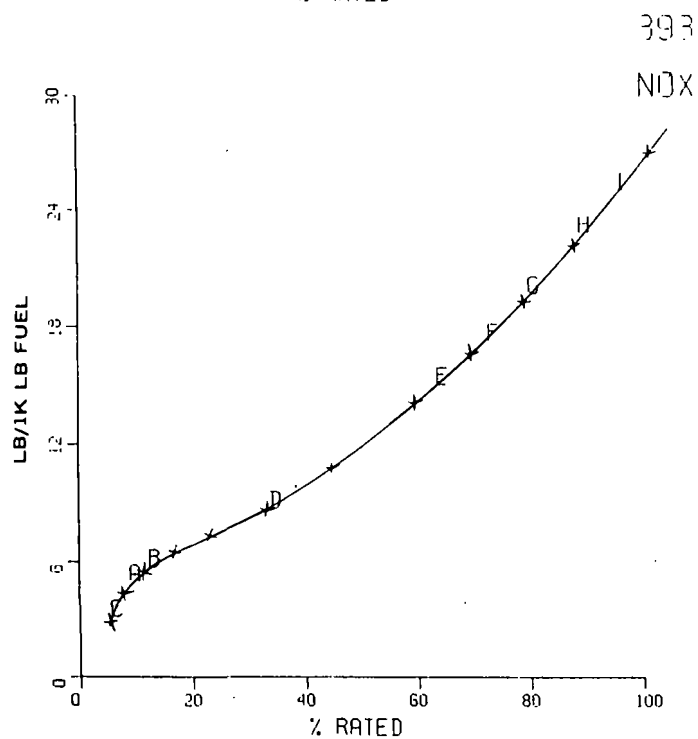
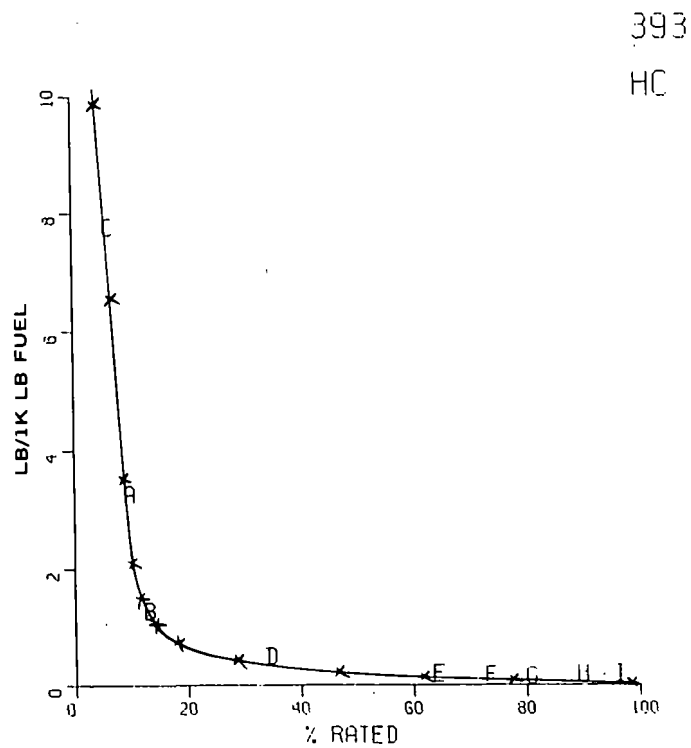
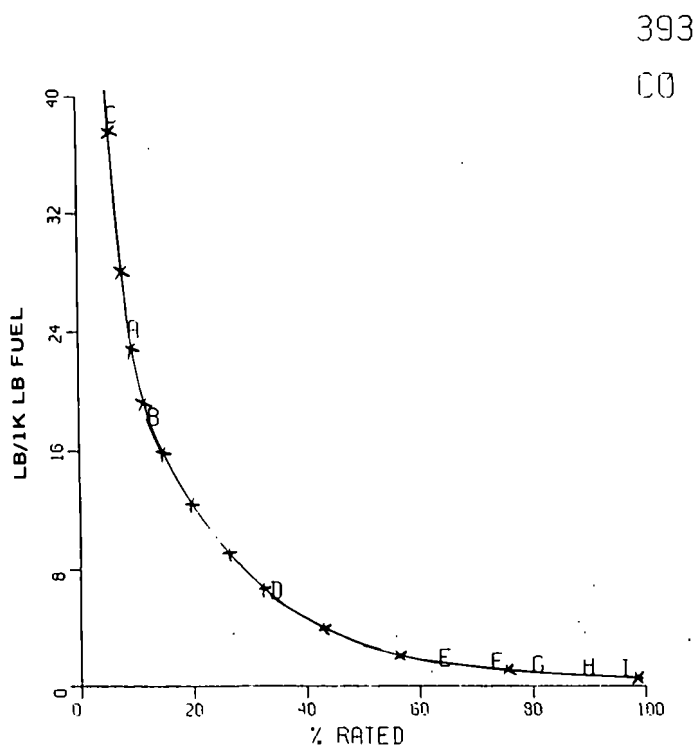


Figure 4 TYPICAL SET OF FAIRED LDX PLOTS FOR A TEST

The sample plots represent one of the better sets of data in that there are an adequate number of well-spaced test points. Each curve was read at that point marked with an 'x' as shown.

To facilitate curve reading, a Calma Model 303 Digitizer<sup>\*</sup> was used. The Calma digitizer reduces graphical analog data to digital magnetic tape for subsequent computer processing and analysis. The equipment consists of the console, a backlighted tracking bed, balanced torque-motor chart drive, stylus-carriage assembly, direct digital pick-off mechanism, data and control electronics frame and an output incremental tape drive.

To digitize graphical analog data directly on magnetic tape, the operator traces the analog plot with a movable stylus/carriage assembly. As the plot is traced, movement of the stylus in either the X or Y direction causes pulses to be generated by the direct digital pick-off mechanism. For purposes of this program, the device was operated in its single-point mode. By locating the stylus on each of the points to be read,<sup>\*\*</sup> the operator could rapidly and efficiently record the X, Y coordinates of the curve points for subsequent use in the interpolation process.

To evaluate the repeatability of the digitizing process, one of the plots was read in duplicate. A comparison of the results of the two sets of coordinates is shown in Table 2. As can be seen, the maximum difference between duplicate readings is considerably less than 1% of full scale.

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<sup>\*</sup>The Calma Company, 346 Mathew Street, Santa Clara, California.

<sup>\*\*</sup>These points were pre-marked as a part of the fairing process.

Table 2  
REPEATABILITY OF DIGITIZING PROCESS

| Run #1   |          | Run #2   |          |
|----------|----------|----------|----------|
| <u>x</u> | <u>y</u> | <u>x</u> | <u>y</u> |
| 6.40     | 4.69     | 6.40     | 4.68     |
| 7.20     | 3.71     | 7.00     | 3.71     |
| 9.20     | 3.05     | 9.40     | 3.05     |
| 11.00    | 2.53     | 11.00    | 2.54     |
| 14.80    | 1.93     | 15.00    | 1.93     |
| 20.80    | 1.93     | 20.40    | 1.44     |
| 29.20    | 0.97     | 29.00    | 0.99     |
| 43.40    | 0.53     | 43.40    | 0.53     |
| 52.80    | 0.37     | 52.80    | 0.37     |
| 58.20    | 0.32     | 58.20    | 0.31     |
| 76.00    | 0.14     | 76.00    | 0.13     |
| 99.40    | 0.08     | 99.20    | 0.08     |

#### Interpolation for Selected Modes

After the curves were faired and digitized, the data were loaded on a computer tape and the tape processed by a program which interpolated for selected operating modes for each engine. Mode selection, time-in-mode information and the corresponding engine settings were supplied by the EPA. The following modes were specified: taxi/idle, take-off, climb-out, approach and taxi/idle. Climb-out and approach times correspond to those associated with operations below an altitude of 900 meters above ground level. Engine settings for turboprops were given in terms of a percentage rated take-off horsepower while those for thrust-type turbines were in terms of percentage rated take-off thrust.

By virtue of the available plots, now stored in the computer and accessible by interpolation, specified percentage rated thrust values were then used as the basis for interpolating mass emission rates for CO, HC and NO<sub>x</sub> as well as the fuel mass rate. These rate values, when combined with the given times in mode, made possible the computation of the total mass of emissions for a typical landing-take-off (LTO) cycle.

The engine power settings initially were subject to changes by the EPA to permit an evaluation of the effects of such variations within the operational modes on individual and aggregated mass emissions of pollutants. One of the salient features of the data processing procedures adopted is the ease of accommodating such changes of input. Engine settings used in the processing of the turbine/turboprop data to establish the so-called "base line" from which proposed standards were promulgated are given in Figure 6 of this report.

A significantly different procedure was employed for processing the piston engine data, which came from two independent sources (as shown in Table 1). This change in method was necessitated since these sets of data were incompatible with each other and with the turbines from the data processing standpoint. Specifically, the one set (Continental Teledyne) lacked CO<sub>2</sub> measurements while the other (Scott Research Laboratories) lacked horsepower data for the various engine power settings. The auxiliary power units comprised a distinct category apart from the other engines and were accorded separate treatment.

### 1.3 STATISTICAL ANALYSIS

Outputs from the overall assessment were subjected to only a routine statistical treatment during this first phase of the program. Identifiably different engine types and models were separated into individual groupings. For the set of engines pooled within each group, mean values and standard deviations from the mean were computed for various engine operational parameters and pollutant quantities for each mode. Specific details concerning these

quantities are included in the next section of the report. Standard deviations were computed on a "best estimate" basis by applying the theory of small number statistics. In essence, this involves using the quantity  $N-1$  as the divisor of the sums of squares ( $N$  = number of samples summed).

A more thorough statistical treatment of these data will be conducted during the second phase of this program. A report of this study will be published during November 1971. The objective of this analysis will be to attempt to identify and isolate those factors which contribute significantly to the variance in the data and to define the relative magnitude of the contribution of each.

#### 1.4 PRESENTATION OF RESULTS

All of the numerical data presented in the report are in the form of computer print-out data sheets. Each engine test for which data were received has been included in the listing. In all cases the data for each engine test have been processed to the maximum extent possible (i.e., each mode in the LTO cycle appropriate to that engine as well as the aggregation of the emissions over the entire cycle). In those cases where insufficient data are provided to permit complete processing, the emission data are converted from a concentration basis to a mass emission basis. On the other hand, when engine fuel flow data are unavailable, the conversion to mass emissions is not possible and the test organization's raw measurement results are simply reproduced.\*

The general format employed on the computer print-out sheets is specified by the EPA. The data given for each engine test include the test information received as well as the results of the data analysis procedures. Input data is reproduced following the general guidelines of the standard EPA data sheets (Figures 2 and 3), and, in substance, includes almost all of

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\* Only about 2% of the data are included in this category.

the data initially supplied by the testing organization.\*

Following this "replay" of the input data, the calculated mass emissions data are tabulated for each engine power setting of the test sequence. These data are expressed as mass pollutant per 1000 lbs fuel, mass pollutant per hour and mass pollutant per 1000 horsepower-(or thrust) hours (when CO<sub>2</sub> measurements are available, similar data are given for CO<sub>2</sub> although it is not classified as a pollutant).

The final tabulation of data is that for the emissions for the LTO cycle for that engine. Data format provided by the EPA for these data is shown in Figure 5. For the turbine/turboprop engine category the EPA also provided the following data for each model (note that the initial idle/taxi and final idle/taxi modes are treated as distinct and separate parts of the LTO cycle): engine power setting, useage weighting factor and time in mode. Numerical specifications for these quantities are given in the commentaries pertinent to each data set.\*\*

Piston engines were tested at power settings corresponding to various nominal modes (the number of modes generally being a larger number than that given in Figure 5). As a consequence, with EPA concurrence, the modes corresponding to the EPA LTO cycle were directly selected from the testing organizations test sequence (no interpolation on power settings was done as for the turbine/turboprop category). In this case, the EPA provided only specifications for weighting factors and times in mode (no power settings).

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\* Some testing organizations, which did not use the standard data forms, provided additional engine parameter data not required for present data processing purposes. In such cases not all of these inputs are reproduced.

\*\* In the context of this report the following data sets are recognized: turbine/turboprop, piston engine (Scott), piston engine (Continental), APU.

| MODE                           | POWER<br>SETTING | POWER<br>OUTPUT | EMISSION<br>RATE | FUEL<br>RATE | USEAGE<br>WEIGHTING<br>FACTOR | TIME IN<br>MODE | POLLUTANT<br>MASS | FUEL<br>MASS | #POL/<br>1000 #<br>FUEL | ENERGY<br>OUTPUT | # POL /<br>ENERGY<br>OUTPUT |
|--------------------------------|------------------|-----------------|------------------|--------------|-------------------------------|-----------------|-------------------|--------------|-------------------------|------------------|-----------------------------|
| TAXI/<br>IDLE                  |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| TAKE-<br>OFF                   |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| CLIMB-<br>OUT                  |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| APPROACH                       |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| TAXI/<br>IDLE                  |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| TOTAL FOR CYCLE                |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| # POLLUTANT/1000 # FUEL/CYCLE  |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| # POLLUTANT/1000 # T -HR/CYCLE |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |
| # POLLUTANT/1000K #T AT T.O.   |                  |                 |                  |              |                               |                 |                   |              |                         |                  |                             |

Figure 5 LTO CYCLE EMISSIONS - EPA FORMAT SHEET

The arrangement of the data within the data sets groups the engines by model. Following each group is an aggregated summary of the LTO-cycle emissions for this model engine. The number of engines included in each summary is shown at the top of the summary sheet. Since the summary accounts show means and standard deviations in each of the tabular columns, engines that did not have complete data (e.g., HC or CO was missing or possibly a mode was missing) are not included in the summary because of the distortions that would be thereby produced in the results.

As per instructions, all emissions data for the military turbine engines are converted into a mass basis. Data for the auxiliary power units are also on a mass basis. An additional calculation is made for the APU's (where applicable) to determine the so-called "air power" for those units operated with air bleed loading. This quantity is added to the shaft horsepower (if any) of the unit to provide a measure of the total energy output.

It is important to note that the mass emissions of the hydrocarbons are in terms of methane while those for nitric oxides ( $\text{NO}_x$ ) are in terms of  $\text{NO}_2$ . This usage is consistent throughout this report.

## 1.5 DISCUSSION

To date the principal function of CAL in this program has been in coordinating and consolidating the mass of field test data, in developing suitable data processing procedures and, finally, in processing the raw data in accordance with guidelines supplied by the Office of Air Programs of the EPA. There has been no requirement or intent to draw conclusions or inferences from the final results that have been obtained. Rather the objective of this report is to present the raw data input, describe the details of the data processing procedures and to present the results. Thus the substance of this section of the report is devoted to generally clarifying sundry background details concerned with data handling and to explanatory comments related to the tabulated data.

Despite the somewhat circumscribed role of CAL in this program (as described above), CAL's view of its overall function has been broader than mere calculations of the results of engine emission tests. CAL has believed an analysis of data must proceed within a framework that includes an engineering awareness and understanding of the real world within which the test results have been obtained. Accordingly, very early in the program (29 June 1971), project personnel visited Pratt & Whitney Aircraft to observe testing operations in progress and to discuss operational and instrumentation details with cognizant personnel. This trip was extremely valuable in providing the "real world" background within which the data transmitted for analysis had been obtained.

The ultimate purpose of the data processing was to obtain results for the emission of each engine for the complete LTO cycle in accordance with Figure 5. A listing of the specific information provided by the EPA to accomplish this purpose is given in Figure 6. Engine operating cycles, as supplied by EPA, have been constructed based on time-in-mode considerations of high activity periods at major air carrier airports. The first taxi-idle mode is defined to include the total time between propulsion engine start-up and the initiation of the turn into the runway. The take-off, climb-out and approach modes approximate the times spent in these modes. The last taxi-/idle mode includes the taxi/idle time between termination of the landing run and final shutdown of the propulsion engine. Both the time-in-mode and power setting information was obtained by the EPA from engine manufacturers, air frame manufacturers, the airlines and the FAA. The weighting factors are the fraction of the propulsion engines operating on a given aircraft in any given mode. Results obtained from processing the data in accordance with the requirements of Figure 6 are presented in Tables I, II and IV. This set of results constitutes the aircraft emissions baseline data. Summaries obtained by aggregating all engines of a given model are included also.

The basic emissions data was reprocessed a number of times using power settings and weighting factors different from those given in Figure 6. These inputs, provided by the EPA, were designed to evaluate the effects of

Figure 6

SUMMARY OF EPA INPUTS EMPLOYED FOR LTO-CYCLE EMISSION CALCULATIONS

| MODES              | CLASS T1                    |      |        | CLASS T2                                                              |      |        | CLASS T3                    |      |        | CLASS P1                    |      |        |
|--------------------|-----------------------------|------|--------|-----------------------------------------------------------------------|------|--------|-----------------------------|------|--------|-----------------------------|------|--------|
|                    | TURBOPROPS/TURBINES         |      |        | TURBINES                                                              |      |        | TURBINES                    |      |        | LIGHT UTILITY PISTON        |      |        |
|                    | POWER<br>SETTING<br>% RATED | W.F. | T.I.M. | POWER<br>SETTING<br>% RATED                                           | W.F. | T.I.M. | POWER<br>SETTING<br>% RATED | W.F. | T.I.M. | POWER<br>SETTING<br>% RATED | W.F. | T.I.M. |
| FIRST<br>TAXI/IDLE | T56 = 3%<br>AIRESEARCH = 6% | 1    | 19     | CJ805 = 4%, JT3C = 5%<br>JT3D = 5%, JT4A = 5%<br>JT8D = 6%, SPEY = 4% | 1    | 19     | JT9D = 7%                   | 1    | 19     | *                           | 1    | 12     |
| TAKE OFF           | 100%                        | 1    | 0.5    | 100%                                                                  | 1    | 0.7    | 100%                        | 1    | 0.7    | *                           | 1    | 0.3    |
| CLIMB              | 90%                         | 1    | 2.5    | 85%                                                                   | 1    | 2.2    | 85%                         | 1    | 2.2    | *                           | 1    | 5.0    |
| APPROACH           | 30%                         | 1    | 4.0    | 40%                                                                   | 1    | 4.0    | 30%                         | 1    | 4.0    | *                           | 1    | 6.0    |
| LAST<br>TAXI/IDLE  | T56 = 3%<br>AIRESEARCH = 6% | 1    | 7.0    | CJ805 = 4%, JT3C = 5%<br>JT3D = 5%, JT4A = 5%<br>JT8D = 6%, SPEY = 4% | 1    | 7.0    | JT9D = 7%                   | 1    | 7.0    | *                           | 1    | 4.0    |

W.F. = USAGE WEIGHTING FACTOR

T.I.M. = TIME IN MODE, MINUTES

\*NOT SPECIFIED, MODE DATA WAS SELECTED DIRECTLY FROM  
TEST ORGANIZATION'S SCHEDULE OF TEST MODES AS GIVEN  
ON DATA SHEETS

operational changes on emissions. Table V presents model summary data for the turboprop/turbine category generated by using altered weighting factors and power settings. This data represents a recomputation of the baseline data, taking into account possible ground operational changes. The tables reflect what the emissions would be for those engines normally used on 3 engine aircraft if one engine was shut off during both taxi/idle modes (2/3 weighting factor) and the power output of the remaining engines was increased 50% to maintain total aircraft power at the same level. For engines normally used on 2 or 4 engine aircraft the tables reflect what the emissions would be if 1/2 of the engines were shut off during both taxi/idle modes (1/2 weighting factor) and the power output of the remaining engines was increased 100% to keep the total aircraft power at the same level.

A few comments on grouping within models are appropriate. Special treatment was accorded the JT8D models as per directions. The JT8D engine is somewhat unique in that the by-pass airflow and the combusted exhaust gases exit through a common duct. Mixing of the exhaust gases with the bypass airflow was found to occur at engine idle settings resulting in dilution of the sampled gases when the nominal multi-probe gas sampling configuration was used. To combat this problem Southwest Research Institute (SWRI) measured emissions of the JT8D engines in the idle mode using a single axial probe (Ref. 3). Thus all SWRI JT8D data has been treated as "undiluted" and all other JT8D data as "diluted".

Another factor unique to JT8D engines is the presence of smokeless combustor cans (retrofits) on some of the older models. These are identified by remarks of the test organization under the "comments" section of each engine data sheet. Thus Table IV has four separate summaries for the JT8D model: diluted-ordinary, diluted-smokeless, undiluted-ordinary, undiluted-smokeless.

A separate grouping was also accorded the T56-A7 and the T56-A15 turboprop engines. The former represent overhauled engines tested at Kelly AFB by SWRI while the latter are new engines tested by the manufacturer, Allison.

In all cases, model groupings exclude engines which lack complete data (either missing data on one of the pollutants, or, in the case of piston engines, a missing mode). Their inclusion would bias and distort the means and standard deviations computed for each model.

Reference to the data sheets will show that in some cases data were measured on aldehyde concentration, smoke index and particulates. These data were not processed and are simply reproduced for completeness. Analysis of these quantities was performed by the individual testing organizations and the results are included in their respective final reports. These final reports should be consulted for specific details concerning the background of the emissions concentration data which have been processed on this program.

In general, that portion of the tabulated data for each engine that corresponds to input information from the test organization, has been reproduced without change. In some cases the units of certain quantities were changed to preserve consistency among the data sets and in others approximate values were estimated. For example, H/C information was not often provided on the data sheets since the fuel had not been analyzed in situ.\* CAL-estimated values would therefore be inserted to permit data processing. An H/C value of approximately 2 was used for turbine fuel.

Relative humidity and temperature at the test sites were usually given but not the corresponding specific humidity (lbs water per lb dry air). In these circumstances the specific humidity data, as read from a graphical presentation (Ref. 4), were entered.

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\* SWRI provided an initial measured H/C value for tests at TWA. Since this value (1.722) seemed too low, CAL chose to ignore this figure and used a value of 2.02. Later SWRI notified CAL that a reappraisal indicated a value of 1.968 for H/C. Since these two values were so close and time so critical, the H/C ratio was not changed.

Averaged data were used if a range of values for ambient parameters was given. For example, the Bureau of Mines reported sizeable variations in the sample line temperature during test operations (of the order of 70°C). The figure given is the arithmetic mean of the extremes.

In the tabulated data, all missing, unavailable or non-measured information is denoted by -0.00 to differentiate it from a true measurement which is actually zero. Concentration measurements shown as a true zero represent a value of less than one part per million.

No mode-type operational data for military engines was provided; consequently only the conversion to mass emissions was made. The T56 turboprop, although a military engine, is considered to be equivalent to the 501 civil version and hence was used in the baseline calculations.

The Office of Air Programs conducted a program of span gas checks at each of the test sites to gain assurance that there were no large discrepancies among these test organizations attributable to poor quality calibration gases or poor sampling techniques. Results of these tests are given in Appendix A.

In the preparation of this report, every possible effort has been made to eliminate errors in data transcription, conversion of pollutant concentration data to mass emission form, and calculation of pollutant burden over the LTO cycle. In view of the stringent time constraints of the program, however, it will be appreciated that it is virtually impossible to guarantee that the report will be error free. If a particular entry appears out of context, therefore, it may need to be validated by checking with the original data source.

The methods employed to reduce the concentration data to mass emission form and to calculate the pollutant burden over the LTO cycle were selected as the most reasonable and timely within the constraints of the program. We recognize, however, that there will undoubtedly be instances

in which the reader may wish to depart from the methods employed in the report or to undertake an alternative analysis for specific purposes. It is for these reasons that we have provided, wherever possible, the raw input concentration data as well as the data in mass-emission form.

In the case of the turbine engines we have employed a computer-aided graphical technique to interpolate emissions at specified power or thrust values. Such interpolation suffers from the limitations of all interpolative procedures in that a certain arbitrariness is involved in extending the results obtained from a limited number of test points to situations in which actual observations were not available. Unfortunately, the engine operating condition most subject to this type of error is the taxi/idle mode with its attendant heavy influence on the total emissions calculated for the LTO cycle. In many instances, the taxi/idle mode as actually run in the test is at a higher percentage of rated power or thrust than is called for by the EPA-designated LTO cycle (see Fig. 6). In these cases, it was necessary to extrapolate to the desired power or thrust setting. Such extrapolation is difficult at best and, in the present analysis, was often further aggravated by lack of test points in the critical "knee" of the CO and HC curves at engine settings slightly above taxi/idle values. The only recourse under these circumstances is to rely on engineering judgment or to invoke mathematical conventions, such as regression analysis, which may be equally arbitrary. For final arbitration of this question, the reader may wish to make his own interpolations from either the raw concentration data or the data as converted to mass emission form, both of which have been provided in the report. The method of analysis employed in this report is not claimed to be absolute any more than any other interpolative procedure can make such claim.

As has been previously pointed out, a major advantage which can be claimed for the computer-aided graphical analysis is the speed with which data may be manipulated in compliance with changes in the questions to be answered by the data base. For example, if it is desired to know the effect on emissions of a change in ground-operation tactics, the relevant information can be quickly and efficiently retrieved from the data. The same facility is available

as a means for checking the accuracy of the plotted data. By virtue of the accessibility of the digitized curves in the computer, the original curves could be "reconstituted" and visually scanned for possible errors. In addition to performing this error check, we also performed an extrapolation check in that region of the pollutant curve where it was necessary to extrapolate in order to obtain mass emissions for the taxi/idle mode. It is for these reasons that the results for the LTO cycle can be reported with considerable confidence.

#### 1.6 SUMMARY

Experimental data consisting of concentration measurements of pollutants in the exhaust gases generated by turboprop and thrust turbine aircraft engines, light-utility piston aircraft engines and auxiliary power units have been processed, wherever applicable and possible, to establish mass emissions over specified landing-take-off (LTO) cycles. These experimental data and the LTO cycle specifications were furnished by the Office of Air Programs, EPA and the intent of the processing was to provide baseline data with the view of promulgating emission standards.

Processing of the data for commercial engines in the turboprop/turbine category was designed to permit calculation of pollutant mass emissions over an entire LTO cycle where the engine power settings could be arbitrarily specified. This purpose was achieved by graphically establishing a functional relationship between mass pollutants/unit fuel consumed and percent rated power for each individual engine. Thus by interpolation techniques, emissions corresponding to any desired engine power setting could be determined. This capability permitted evaluation of the effects of changes in engine operating cycles on mass emissions over the LTO cycle (compare engine model summary data between Table IV and Table V).

In contrast to the situation for the turboprop/turbine engine category, the piston engine emission data were measured under conditions of very uniform consistency between engine power setting and engine operational mode. LTO

cycle emissions for this class of engines were computed by using the measured in-mode concentration measurements. No interpolative routines were necessary.

Military turbine engine emissions data were only converted from a concentration basis to a mass emission basis. No LTO cycle criteria were defined for these engines.

Auxiliary power units represent a distinctly unique source of exhaust pollutants within the context of the types of aircraft engines tested. Only the mass emissions for each power setting employed in the test sequence are given. Total horsepower loading for each unit is given by calculating the power associated with air bleed loading (as contrasted with shaft power loading) wherever appropriate.

All of the pertinent data on each engine tested and supplied to CAL has been reproduced in this report.

All of the emissions data has been processed to the maximum extent possible within the constraints imposed by the available supporting information and the requirements of the Office of Air Programs. A total of 392 engine test runs are reported. This total includes 199 turboprop/turbine engines, 140 piston engines and 53 auxiliary power units.

#### 1.7 REFERENCES

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4. Taylor, C.F. and Taylor, E.S., The Internal Combustion Engine, Second Edition, International Textbook Company, Scranton, Pa. (1969) p. 31.

## Appendix A

### SPAN-GAS CHECKS OF TEST ORGANIZATIONS INSTRUMENTATION

Seven span gas cylinders were analyzed by three of the laboratories involved in the aircraft baseline emission. These initial checks were made at those aircraft study laboratories located in the Western half of the country; EPA (T&EB Mobile) at Phoenix (AiResearch), Southwest Research Institute (SWRI) at San Antonio (Kelly AFB) and Bureau of Mines (BOM) at Tulsa (American Airlines). The exercise was not intended to be a correlation of laboratories but an attempt to uncover major differences in analysis among laboratories which might be caused by the use of poor quality calibration gases or poor sampling techniques. The results that have been obtained raise questions concerning carbon monoxide analyses but the overall effort has been worthwhile in building confidence in comparability among the above-named laboratories engaged in the emissions measurement program.

Table A-1 is a summary of the data collected. Detailed information was accumulated also concerning the physical specifications of each instrument used so that an estimate could be made of instrumental sensitivity and expected accuracy. The sample cell length and calibration range were found to vary considerably from one instrument to another. Based on this type of information, an optimistic accuracy band was estimated for each instrument and is given as a parenthetical value adjacent to each data point in Table A-1. The largest variation in expected accuracy is seen to occur among the CO instruments. Variation in concentration measurements was also the largest for CO but this fact is not considered entirely attributable to instrument variation.

Sampling systems were checked for leaks by plugging the sample line and observing the flow drop-off. All systems appeared to be tight.

A cylinder of hydrocarbon-free air was used to check the hydrocarbon level in the zero gas being used by these laboratories. The zero gas at SWRI

was found to contain less than 0.6 ppm propane and the BOM span gas contained 1.6 ppm propane. The EPA span gas at Phoenix contained zero hydrocarbon relative to the reference cylinder.

At those laboratories using chemiluminescence instrumentation for oxides of nitrogen measurement, a determination of the  $\text{NO}_2$ -NO converter efficiency was made. EPA and SWRI converters approached 100% efficiency. This particular test is made by introducing oxygen into a bag of NO in  $\text{N}_2$  span gas and observing the oxidation of NO to  $\text{NO}_2$ . If the  $\text{NO}_x$  line remains constant during the oxidation process, the indication is that the thermal converter is working properly.

A similar series of cross checks was then conducted at those emissions measuring laboratories in the Eastern half of the country. These test sites included the following: Detroit Diesel Allison Division (Indianapolis, Indiana), Teledyne Continental Motors (Muskegan, Michigan), Pratt & Whitney Aircraft (East Hartford, Connecticut), Scott Research Laboratories (temporary lab at Allentown Pennsylvania Airport) and Scott Research Laboratories (temporary lab at Naval Air Station, Norfolk, Virginia). Addition cylinders of high-concentration gases were employed at those labs involved in light-utility piston engine studies (Teledyne Continental and Scott Allentown). These additional results are given in Table A-2 which is similar in format to Table A-1.

[NOTE: The material in Appendix A has been abstracted by CAL from two internal memoranda of the Office of Air Programs, Tests & Evaluation Branch, Ypsilanti (to R.C. Stahman from M.W. Korth). This inclusion is at the behest of the EPA.]

Table A-1  
SPAN GAS CROSS CHECK  
(WESTERN LABORATORIES)

| CYLINDER NO.                             | EPA                      |                                      |                                       | SWRI<br>(KELLY<br>AFB)     | BOM<br>(AMERICAN)                    |
|------------------------------------------|--------------------------|--------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
|                                          | (MAIN<br>TERM.)          | (BLDG. 2042)                         | (T&EB<br>PHOENIX)                     |                            |                                      |
| A247<br>HYDROCARBON<br>(ppm, PROPANE)    | 70.0 ( $\pm$ 1)          | 72.2 ( $\pm$ 1)                      | 70 ( $\pm$ 1)                         | 67.5 ( $\pm$ 1.5)          | 69 ( $\pm$ 1)                        |
| 13359-B<br>HYDROCARBON<br>(ppm, PROPANE) | 10.8 ( $\pm$ 1)          | 10.5 ( $\pm$ 1)                      | 10.6 ( $\pm$ 1)                       | 8.4 ( $\pm$ 1)             | 9.2 ( $\pm$ 0.5)                     |
| A6775<br>CO, ppm                         | 84 ( $\pm$ 25)           | 82 ( $\pm$ 25)                       | 120 ( $\pm$ 10)                       | 94 ( $\pm$ 2)              | 95 ( $\pm$ 1)                        |
| A672<br>CO, ppm<br>CO <sub>2</sub> , %   | 500 ( $\pm$ 25)<br>----- | 494 ( $\pm$ 25)<br>1.57 ( $\pm$ .05) | 560 ( $\pm$ .05)<br>1.61 ( $\pm$ .05) | -----<br>1.53 ( $\pm$ .05) | 530 ( $\pm$ 10)<br>1.54 ( $\pm$ .05) |
| A6741<br>CO <sub>2</sub> , %             | -----                    | 4.2 ( $\pm$ .05)                     | 4.12 ( $\pm$ .05)                     | 4.05 ( $\pm$ .05)          | 4.22 ( $\pm$ .05)                    |
| A2334<br>NO, ppm                         | 87 ( $\pm$ 1)            | 82.2 ( $\pm$ 1)                      | 92.5 ( $\pm$ 1)                       | 82 ( $\pm$ 1)              | 87 ( $\pm$ 1)                        |
| SSB-162<br>NO, ppm                       | 20.0 ( $\pm$ 1)          | 21.0 ( $\pm$ 1)                      | 21.0 ( $\pm$ 1)                       | 19 ( $\pm$ 1)              | 18 ( $\pm$ 1)                        |

Table A-2  
SPAN GAS CROSS CHECK (EASTERN LABORATORIES)

| CYLINDER NO.                                                  | EPA                                                      | ALLISON                             | CONTI-<br>NENTAL                              | P&W                                  | SCOTT<br>NORFOLK                      | SCOTT<br>ALLENTOWN                                    |
|---------------------------------------------------------------|----------------------------------------------------------|-------------------------------------|-----------------------------------------------|--------------------------------------|---------------------------------------|-------------------------------------------------------|
| A-247<br>HYDROCARBON<br>(ppm, PROPANE)                        | 71 ( $\pm$ 1)                                            | 60 ( $\pm$ 1)                       | -----                                         | 57.3 ( $\pm$ 2)                      | 68.1 ( $\pm$ 1)                       | -----                                                 |
| 13359-B<br>HYDROCARBON<br>(ppm, PROPANE)                      | 10.7 ( $\pm$ .5)                                         | 7.5 ( $\pm$ .5)                     | -----                                         | 9.0 ( $\pm$ .5)                      | 9.7 ( $\pm$ .5)                       | -----                                                 |
| A6775<br>CO (ppm)                                             | 83. ( $\pm$ 20)                                          | 101 ( $\pm$ 2)                      | -----                                         | 93 ( $\pm$ 5)                        | 101 ( $\pm$ 5)                        | -----                                                 |
| A672<br>CO (ppm)<br>CO <sub>2</sub> (%)                       | 500 ( $\pm$ 25)<br>1.57 ( $\pm$ .05)                     | 565 ( $\pm$ ?)<br>1.68 ( $\pm$ ?)   | -----<br>-----                                | 515 ( $\pm$ 20)<br>1.55 ( $\pm$ .03) | 530 ( $\pm$ 20)<br>1.57 ( $\pm$ .03)  | -----<br>-----                                        |
| A-6741<br>CO <sub>2</sub> (%)                                 | 4.2 ( $\pm$ .05)                                         | 4.5 ( $\pm$ .05)                    | -----                                         | 4.16 ( $\pm$ .05)                    | 4.28 ( $\pm$ .03)                     | -----                                                 |
| A-2334<br>NO (ppm)                                            | 85 ( $\pm$ 1)**                                          | 87 ( $\pm$ 3)*<br>89.5 ( $\pm$ 2)** | -----<br>-----                                | 78 ( $\pm$ 3)*                       | 81.6 ( $\pm$ 2)**<br>67.5 ( $\pm$ 5)* | -----<br>-----                                        |
| SSB-162<br>NO (ppm)                                           | 20.5 ( $\pm$ 1)**                                        | 21 ( $\pm$ 3)*<br>20 ( $\pm$ 2)**   | -----<br>-----                                | 19.5 ( $\pm$ 3)*                     | 19 ( $\pm$ 2)**<br>13 ( $\pm$ 3)*     | -----<br>-----                                        |
| I-15738<br>NO (ppm)                                           | 1240 ( $\pm$ 50)**                                       | -----                               | 1140 ( $\pm$ 100)*                            | -----                                | -----                                 | 1250 ( $\pm$ 50)**                                    |
| A-1905<br>CO (%)                                              | 1.56 ( $\pm$ .03)                                        | -----                               | 1.5 ( $\pm$ .03)                              | -----                                | -----                                 | 1.5 ( $\pm$ .2)                                       |
| 1-4523<br>HYDROCARBON<br>(ppm, PROPANE)                       | 1110 ( $\pm$ 20)                                         | -----                               | 1060 ( $\pm$ 20)                              | -----                                | -----                                 | 1024 ( $\pm$ 20)                                      |
| FF-17054<br>CO (%)<br>CO <sub>2</sub><br>HC<br>(ppm, PROPANE) | 3.99 ( $\pm$ .15)<br>7.64 ( $\pm$ .2)<br>731 ( $\pm$ 30) | -----<br>-----<br>-----             | 3.95 ( $\pm$ .05)<br>-----<br>700 ( $\pm$ 30) | -----<br>-----<br>-----              | -----<br>-----<br>-----               | 4.2 ( $\pm$ .2)<br>7.7 ( $\pm$ .2)<br>695 ( $\pm$ 30) |

\*NDIR

\*\*CHEMILUMINESCENT

Part 2  
SUMMARY OF DATA

## 2.1 DATA TREATMENT AND COMMENTARY

Data for light-utility piston engines and auxiliary power units are presented in the first three tables following this discussion. Table I contains data on piston engines tested by Scott Research Laboratories and Table II contains similar data obtained from Teledyne Continental Motors. Table III is a compilation of data on auxiliary power units (APU); these data were provided by AiResearch.

### 2.1.1 Piston Engines

Tests on piston engines were conducted by Scott Research Laboratories on engines installed in aircraft. Accordingly, these engines span a broader spectrum of engine age and condition than do the "brand new" engines tested by Teledyne Continental. Differences in the methods of testing and data reduction employed by Scott and by Teledyne Continental, however, necessitated different approaches to mass emissions analysis and precluded incorporating the two sets of data into a single compilation. In view of this fact, care should be taken in comparing results from the two sources, particularly if the intent is to establish emission response to factors such as engine age. Observed differences in emissions may be artifacts of the differences in testing procedures rather than being attributable to independent causes.

#### 2.1.1.1 Scott Research Laboratories

Piston engines tested by Scott Research Laboratories are included in Table I. For the most part, these engines were subjected to a 10-mode test cycle, but in a few instances certain of the modes are missing. From among the ten modes used by Scott, five were selected as being equivalent to those designated by EPA in their LTO cycle. These five modes were then employed in the LTO cycle calculations. Since no horsepower measurements were provided by Scott, it was not possible to reduce the emissions to the basis of pounds pollutant per thousand horsepower hours.

All concentration data provided by Scott Research Laboratories were expressed on a dry basis. To convert these data to emission mass form, therefore, it was necessary to introduce a correction to convert concentrations from dry to wet basis. Correction was made only for the water of combustion, it being assumed that water vapor in the intake air was negligible. The correction factor used was the one proposed by the SAE E-31 Committee\* :

$$K = \frac{100}{100 + \alpha/2 (CO + CO_2)}$$

where CO and CO<sub>2</sub> concentrations are expressed as percent by volume, and  $\alpha$  is the atomic hydrogen/carbon ratio of the fuel. Then,

$$\text{Concentration (Wet basis)} = K \cdot \text{Concentration (dry basis)}$$

and the corrected concentrations were converted to pounds pollutant per pound of fuel by the formulas proposed by the E-31 Committee and presented in Part 1 of this report.

It should be noted that, for many of the engines tested by Scott, triplicate runs were made. In the statistical summary for an engine model, these replicate runs were not distinguished from runs on separate engines; consequently, the standard deviations computed for the emission quantities are expected to be somewhat underestimated relative to what might have been observed if there had been no replication of engines. In the triplicate runs on 0-200 engines, the first two runs were done on one exhaust and the third run was done on the other.\*\*

In the statistical summaries it will be noted that the number of engines included in each model summary is sometimes less than the number of engines actually processed as individuals. The difference resides in the fact that for

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\* R.W. Hurn et al., "Procedure for the Continuous Sampling and Measurement of Gaseous Emissions From Aircraft Turbine Engines," Final Draft SAE E-31 Committee Paper (May 25, 1971).

\*\* Letter dated July 22, 1971 from Mr. A.F. Souza, Scott Research Laboratories to Mr. Charles Gray, Jr., Environmental Protection Agency.

several of the engines the data was incomplete in some sense. For example, if data for one of the pollutants or for one of the modes was missing for a particular engine, that engine was excluded from the statistical summary so as not to bias the mean value or standard deviation.

#### 2.1.1.2 Teledyne Continental Motors

Table II summarizes twenty-one engines belonging to model categories 0-200-A, 0-470-R or IO-520-P. For the most part, these engines were subjected to a 13-mode test cycle, including Idle-Taxi, Take-Off, Climb, and Pattern. Two forms of the Idle-Taxi mode were employed, Idle-Taxi-Low and Idle-Taxi-High. Similarly, two versions of the Climb mode, Rich and Lean, were used, but in some of the tests only one of these modes was run. Some convention was necessary, therefore, in order to comply with the 5-mode LTO cycle designated by EPA. In all cases, Idle-Taxi-High was used as the EPA-designated Idle-Taxi mode, and the mode designated Pattern by Teledyne Continental was renamed Approach, to comply with the EPA designation. In the case of the Climb mode, the LTO cycle computations were made with both Climb-Rich and Climb-Lean data. In all cases where both modes were run, two LTO cycle computations are included; otherwise, the LTO cycle computation is made with whichever of the two Climb modes is available.

A distinguishing feature of the Teledyne Continental tests is that CO<sub>2</sub> was not measured. Consequently, the normally used formulas for converting concentrations to mass emissions are not applicable, and an alternative conversion had to be invoked. The method employed in Table II is the one used by Teledyne Continental and was kindly provided by them.

First, it should be noted that all effluents except Total Hydrocarbons are expressed in the raw data on a dry basis. Except for hydrocarbons, therefore, the following dry-to-wet correction factor was employed:

$$\text{Correction Factor, } K = 1 - \alpha (F/A)$$

where  $\alpha$  = Hydrogen/carbon atom ratio  
 $F$  = Fuel flow, lb/hr  
 and  $A$  = Air flow, lb/hr

This expression for the correction factor is an approximation that is accurate when the specific humidity of the inlet air is low. The complete equation is given in SAE procedure J177. Conversion of CO and NO concentrations to the corresponding mass flow rates was then accomplished by means of the following formula:

$$\text{Pollutant Mass Flow Rate (lb/hr)} = \frac{M}{M_{EX}} \cdot \frac{\text{conc (PPM)}}{10^6} \cdot (F + A) \cdot K$$

where  $M$  = molecular weight of pollutant  
 and  $M_{EX}$  = molecular weight of exhaust

For conversion of total hydrocarbon concentrations to mass flow rate, the formula is:

$$\text{Pollutant Mass Flow Rate (lb/hr)} = \frac{M}{M_{EX}} \cdot \frac{\text{conc (PPM)}}{10^6} \cdot (F + A)$$

The exhaust molecular weight,  $M_{EX}$ , varies as a function of air/fuel ratio. This relationship can be approximated as a straight line, and was represented in the computer calculation by the equation

$$M_{EX} = 21.236 + 0.515 A/F$$

According to Teledyne Continental, this expression is valid for air/fuel ratios less than stoichiometric, but  $M_{EX}$  assumes the constant value 28.96 for air/fuel ratios greater than stoichiometric.\*

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\* Justification for these relationships can be found in C.F. Taylor and E.S. Taylor, The Internal Combustion Engine, Second Edition, International Textbook Company, Scranton, Pa. (1969) pp. 37-39.

Certain conventions must also be followed with regard to molecular weights. To maintain consistency with other data in this report, some modification of the Teledyne Continental input parameters was made. For example, elsewhere in this report it has been customary to express Total Hydrocarbons as methane, molecular weight 16.04. This value departs somewhat from the value of 14.67 used by Teledyne Continental on the basis of formulas employed by the State of California for heavy duty gasoline engine tests. Also, in the interest of consistency, the hydrogen-carbon ratio was taken as 1.84 rather than the 2.12 used by Teledyne Continental on the assumption of a representative gasoline with formula  $C_8H_{17}$ . NO was computed as  $NO_2$  equivalent, using the molecular weight 46.01.

Separate statistical summaries were made for the Climb-Rich and Climb-Lean categories. It will be noted that the number of engines included in each model summary is often less than the number of engines actually processed as individuals. As previously noted, the difference resides in the fact that for several of the engines the data was incomplete in some sense. For example, if data for one of the pollutants or for one of the modes was missing for a particular engine, that engine was excluded from the statistical summary so as not to bias the mean value or standard deviation.

#### 2.1.2 Auxiliary Power Units -- AiResearch

Table III is a compendium of emissions tests made by AiResearch on auxiliary power units. Concentrations in this table are on a wet basis -- that is, the emission concentrations are corrected to concentration in wet exhaust from combustion with dry air.

Mass of pollutant per 1000 pounds of fuel was computed by AiResearch and submitted as part of their report; consequently, it was not necessary to convert pollutant concentrations to mass emission form. Though AiResearch also provided figures for mass of pollutant per hour, it was found more expeditious to compute the mass flow by multiplying pounds pollutant per 1000 pounds of fuel by the corrected fuel flow rate. Note that NO and  $NO_2$  concentrations

were reported separately by AiResearch. These separately measured quantities, as well as the combined concentration of total oxides of nitrogen ( $\text{NO}_x$ ), are reproduced in Table III, but mass emission rates are included only for  $\text{NO}_x$ . The total nitrogen oxides are computed as  $\text{NO}_2$ , molecular weight 46.01.

In addition to the computations performed by AiResearch and incorporated in Table III, additional computations were performed to express emissions on the basis of pounds pollutant per horsepower hour. For this purpose, it was considered advisable to take into account, wherever possible, both shaft horsepower and the horsepower induced by bleed air loading. In this way, emissions can be charged against the combined equivalent horsepower rather than against the less realistic value of shaft horsepower, which is often small or negligible.

The basis for computing total horsepower as the sum of shaft horsepower and air horsepower was provided by Mr. Charles Dawson of the Environmental Protection Agency, Ann Arbor.

The ideal compression power was taken as isentropic, and the applicable formula for air horsepower is based on the assumption of perfect gas laws and the belief that constant specific heats can be assumed with sufficient accuracy. Typical pressure ratios are about 3 (temperature ratio  $\approx 1.36$ ) and inlet compressor temperatures are near normal ambients. For steady flow,

$$\text{Air HP} = 1.415 W \bar{c}_p T_1 \left[ \left( P_2/P_1 \right)^{\frac{K-1}{K}} - 1 \right]$$

where       $W$     =    corrected bleed flow, lbs/sec  
                $T_1$    =    compressor inlet temperature, °F  
                $P_2$    =    compressor discharge pressure, psia  
                $P_1$    =    compressor inlet pressure, psia

Mean compression temperatures are taken as 190°F (650° Rankine) and  $K = 1.398$ . The formula thus reduces to

$$\begin{aligned}
 \text{Air HP} &= (1.415) \cdot W \cdot (0.241) \left[ \left( \frac{P_2}{14.7} \right)^{0.285} - 1 \right] \\
 &= 0.341 W \left[ \left( \frac{P_2}{14.7} \right)^{0.285} - 1 \right]
 \end{aligned}$$

In reducing the AiResearch data to horsepower basis, the air horsepower as computed from the above formula was added to the corrected shaft horsepower. This combined quantity was used as divisor in reducing pounds of pollutant per hour to pounds of pollutant per horsepower hour.

### 2.1.3 Turbine/Turboprop Engines

Data for turbine and turboprop engines are presented in Tables IV and V. Table IV contains baseline data, in which a normal LTO cycle and conventional ground-operation tactics are employed. The basis of the LTO cycle, as prescribed by EPA, is discussed in Part I of this report. Basically, the cycle consists of taxi/idle prior to takeoff, takeoff, climbout, approach and taxi/idle subsequent to landing. To each of these modes a time in mode is assigned in accordance with airport experience.

Table IV presents, for the most part, two pages of information for each engine. On the first page is tabulated the identification of the engine, the engine supplier, the test organization, such essential engine data as thrust or power rating and engine-overhaul history, and prevailing ambient test conditions. This information is followed by a tabulation of test data, including pollutant concentrations and a description of the test modes in terms of engine operating conditions.

At this juncture it should be pointed out that verbal names assigned to the various test modes varied considerably from one test organization to another. In view of this fact and the fact that subsequent designation of modes is mandated by the EPA-prescribed LTO cycle, test modes are tabulated

only in numerical terms. Each test mode is tabulated as a pair of integers separated by a slash. The number preceding the slash denotes the mode under test, whereas the number following the slash denotes the mode previously tested. Thus the entry "3/5" denotes that the data in that line of the table is for the third mode and that the mode which preceded it is in the test sequence was mode 5. Similarly, "3/2" denotes that the third mode was preceded in the test sequence by mode 2. The modes are numbered in ascending order of power or thrust settings; accordingly, the slash notation makes evident whether a particular mode was tested as part of an ascending or descending sequence of power or thrust settings. The sequence of testing is further elucidated by the column labeled either "Clock-Time" or "Elapsed Time." Clock time, such as 2037, denotes "2037 hours", or 8:37 p.m. Elapsed time is in minutes and is measured from a zero time reference at the beginning of the test sequence. If the time entry is -0.00, no time-of-test information was available.

For each test mode, the actual thrust or shaft horsepower is tabulated; this number is followed by "Percent Rated T.O." obtained by dividing the test-mode setting by the rated thrust or horsepower. The resulting values are expressed as integer percentages and are truncated, rather than rounded, quantities. Thus, for example, 5% brackets a range from 5.00% to 5.99%. This fact should be borne in mind in comparing the mass emissions computed from raw data with mass emissions values interpolated for the LTO-cycle calculations.

Mass emissions for each test mode were computed according to the conversion formulas of Section 1.2, Methodology of Data Analysis, and are expressed as pounds of pollutant per thousand pounds of fuel and as pounds of pollutant per hour. Pounds of pollutant per hour is the product of fuel consumption rate, in pounds per hour, and pounds of pollutant per pound of fuel. Finally, the pollutant mass is expressed on the basis of mass of pollutant per unit of energy. For turboprops, this unit is taken as 1000 horsepower hours; for turbines, the corresponding unit is 1000 pounds thrust hours, since horsepower rating is not applicable in this instance.

The converted quantities expressed as pounds of pollutant per pound of fuel were plotted against percent power or thrust and processed as described in Section 1.2 to obtain interpolated values at specified settings for idle/taxi, takeoff, climbout and approach, as specified by EPA. These interpolated values then formed the basis for the calculations tabulated as the second page of information for each engine. If for some reason, such as incomplete data, it is impossible to complete the LTO-cycle calculation, then the second page of information is omitted.

Pollutant mass for a particular mode is computed by multiplying pounds of pollutant per hour by time in mode. Similarly, energy for that mode is found by multiplying thrust or power by time in mode. Division of pollutant mass by energy for each mode gives the corresponding pounds of pollutant per horsepower hour or per pound thrust hour. In a similar manner, pounds of pollutant per pound of fuel for the entire cycle is obtained by dividing the total pollutant mass for the cycle by the total fuel mass for the cycle. The result is a quantity which can be interpreted as the average rate at which pollutant is generated per pound of fuel, the average reflecting appropriately the times spent in the various modes. The pounds of pollutant per 1000 horsepower hours or per 1000 pounds thrust hours is similarly computed by dividing the total pollutant mass for the cycle by the total energy for the cycle.

It will be noted that in some instances the emission rate or mass is recorded as 0.0. This type of entry may occur, for example, when it is necessary to obtain CO or HC values at 100 percent thrust by extrapolation of the corresponding plots of pollutant mass emission versus power or thrust. If the extrapolation yields a negative value, the extrapolated value is defined to be zero. Such a result is completely consistent with facts, because it will not occur unless the pollutant mass is indeed negligible at high power or thrust settings.

Statistical summaries following the results for individual engines are computed in two ways, the two summaries being differentiated by changes in "usage weighting factors." The summary appearing in Table IV applies to

the data for individual engines as displayed in that table and is based on useage weighting factors of unity for all modes. In Table V, the useage weighting factors are 1.00 for takeoff, approach and climb modes but are reduced to either 0.50 or 0.67 for the two taxi/idle modes. The reduced values are based on a modification of ground-operation tactics in which, for two-engine or four-engine aircraft, only half of the engines are in operation and for three-engine aircraft only two-thirds of the engines are in operation. The thrust or power settings for the engines remaining in operation are increased proportionately to compensate for the engines not in operation. Comparison of the two statistical summaries will reveal that substantial reductions in CO and HC emissions may occur as a result of this change, primarily because of the steep negative slope of the CO and HC curves at low power or thrust settings.

## 2.2 TABULATED RESULTS

## **TABLE I**

### **LIGHT-UTILITY PISTON ENGINES SCOTT RESEARCH LABORATORIES**

#### **CONTENTS:**

|                       |                                                                    |
|-----------------------|--------------------------------------------------------------------|
| <b>I-2 TO I-107</b>   | <b>INDIVIDUAL ENGINE RUNS – COMPLETELY PROCESSED</b>               |
| <b>I-108 TO I-110</b> | <b>MODEL SUMMARIES</b>                                             |
| <b>I-111 TO I-116</b> | <b>INDIVIDUAL ENGINE RUNS – MASS EMISSION<br/>CONVERSIONS ONLY</b> |
| <b>I-117 TO I-123</b> | <b>INDIVIDUAL ENGINE RUNS – INPUT DATA<br/>REPRODUCED ONLY</b>     |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 166 ENGINE TYPE AND MODEL: D-200-A SERIAL NUMBER: 204598-9-AA  
RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 284. MRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.50 FINISH 79.00

ATMOSPHERIC PRESSURE: START 30.01 FINISH 30.01

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 64.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.60                           | 62.00                         | 0.03861           |
| IDLE/TAXI   |                 | 2            | -0.0          | 11.50                          | 119.00                        | 0.04045           |
| RUN UP      |                 | 3            | -0.0          | 17.60                          | 202.00                        | 0.04237           |
| RUN UP-LEAN |                 | 4            | -0.0          | 18.40                          | 204.00                        | 0.04413           |
| RUN UP-RICH |                 | 5            | -0.0          | 16.70                          | 195.00                        | 0.04125           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 540.00                        | 0.05349           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 540.00                        | 0.05349           |
| DESCENT     |                 | 8            | -0.0          | 32.80                          | 398.00                        | 0.04461           |
| DESCENT     | ON              | 9            | -0.0          | 39.20                          | 387.00                        | 0.05093           |
| APPROACH    |                 | 10           | -0.0          | 22.00                          | 247.00                        | 0.04322           |
| TAXI        |                 |              |               | 8.90                           | 98.00                         | 0.03790           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 336.00                              | -0.00                              | 3.70                     | 4.00                          | 5003.00              | 16.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 2            | 460.00                              | -0.00                              | 4.80                     | 3.30                          | 4616.00              | 20.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 3            | 807.00                              | -0.00                              | 4.40                     | 4.40                          | 2128.00              | 140.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 796.00                              | -0.00                              | 5.00                     | 4.10                          | 2736.00              | 93.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 807.00                              | -0.00                              | 4.10                     | 4.50                          | 1797.00              | 95.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1110.00                             | -0.00                              | 6.50                     | 4.70                          | 1852.00              | 198.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 7            | 1110.00                             | -0.00                              | 6.50                     | 4.70                          | 1852.00              | 198.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1076.00                             | -0.00                              | 4.10                     | 5.30                          | 1299.00              | 322.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 975.00                              | -0.00                              | 7.10                     | 3.40                          | 2736.00              | 57.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 874.00                              | -0.00                              | 4.80                     | 4.20                          | 1852.00              | 155.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 493.00                              | -0.00                              | 4.30                     | 3.50                          | 2294.00              | 37.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 911.54                             | 70.59                              | 0.0                                 | 1548.36                             | 0.65                               | 0.65                                | 5104.60                 | 395.31                  | 0.0                      | 8670.79                  | 3.63                    | 3.63                     |
| 2            | 1132.63                            | 62.38                              | 0.0                                 | 1223.49                             | 0.78                               | 0.78                                | 13025.24                | 717.39                  | 0.0                      | 14070.09                 | 8.91                    | 8.91                     |
| 3            | 986.27                             | 27.32                              | 0.0                                 | 1549.65                             | 5.15                               | 5.15                                | 17358.29                | 480.81                  | 0.0                      | 27273.79                 | 90.72                   | 90.72                    |
| 4            | 1077.62                            | 33.77                              | 0.0                                 | 1388.41                             | 3.29                               | 3.29                                | 19828.18                | 621.40                  | 0.0                      | 25546.71                 | 60.58                   | 60.58                    |
| 5            | 943.42                             | 23.68                              | 0.0                                 | 1626.95                             | 3.59                               | 3.59                                | 15755.14                | 395.49                  | 0.0                      | 27169.98                 | 59.96                   | 59.96                    |
| 6            | 1153.39                            | 18.82                              | 0.0                                 | 1310.38                             | 5.77                               | 5.77                                | 57207.91                | 933.53                  | 0.0                      | 64994.84                 | 286.24                  | 286.24                   |
| 7            | 1153.39                            | 18.82                              | 0.0                                 | 1310.38                             | 5.77                               | 5.77                                | 57207.91                | 933.53                  | 0.0                      | 64994.84                 | 286.24                  | 286.24                   |
| 8            | 869.16                             | 15.77                              | 0.0                                 | 1765.34                             | 11.21                              | 11.21                               | 28508.27                | 517.30                  | 0.0                      | 57903.03                 | 367.76                  | 367.76                   |
| 9            | 1331.37                            | 29.38                              | 0.0                                 | 1001.75                             | 1.76                               | 1.76                                | 52189.76                | 1151.83                 | 0.0                      | 39268.48                 | 68.82                   | 68.82                    |
| 10           | 1055.73                            | 23.13                              | 0.0                                 | 1451.45                             | 5.60                               | 5.60                                | 23226.13                | 513.24                  | 0.0                      | 31931.80                 | 123.19                  | 123.19                   |
| 10           | 1081.90                            | 33.06                              | 0.0                                 | 1383.65                             | 1.53                               | 1.53                                | 9628.91                 | 294.20                  | 0.0                      | 12314.45                 | 13.61                   | 13.61                    |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 11.50                          | 2.30                 | 1132.63                | 13025.24             | 2.605                  | 62.39                  | 717.39               | 0.143                  | 0.78                   | 8.91                 | 0.0018                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1153.39                | 57207.91             | 0.286                  | 18.82                  | 933.53               | 0.005                  | 5.77                   | 286.24               | 0.0014                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1153.39                | 57207.91             | 4.748                  | 18.82                  | 933.53               | 0.077                  | 5.77                   | 286.24               | 0.0238                 |
| 9                       | 6.00                    | 22.00                          | 2.70                 | 1055.73                | 23226.13             | 2.323                  | 23.33                  | 513.24               | 0.051                  | 5.60                   | 123.19               | 0.0123                 |
| 10                      | 4.00                    | 8.90                           | 0.60                 | 1081.90                | 9628.91              | 0.645                  | 33.06                  | 294.20               | 0.020                  | 1.53                   | 13.61                | 0.0009                 |
| TOTAL FOR CYCLE         |                         |                                | 9.461                |                        |                      | 10.607                 |                        |                      | 0.297                  |                        |                      | 0.0402                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.121                  |                        |                      | 0.031                  |                        |                      | 0.0042                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 167 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 204598-9-AB

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 284. HRS

FUEL: AV GAS 80/87

FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.50 FINISH 82.00

ATMOSPHERIC PRESSURE: START 30.00 FINISH 30.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 56.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 6.40                           | 81.00                         | 0.04323           |
| IDLE/TAXI   |                 | 2            | -0.0          | 9.80                           | 108.00                        | 0.04764           |
| RUN UP      |                 | 3            | -0.0          | 19.30                          | 232.00                        | 0.04807           |
| RUN UP-LEAN |                 | 4            | -0.0          | 16.70                          | 201.00                        | 0.04541           |
| RUN UP-RICH |                 | 5            | -0.0          | 16.70                          | 199.00                        | 0.04852           |
| TAKE-OFF    |                 | 6            | -0.0          | 51.50                          | 564.00                        | 0.05615           |
| CLIMB       |                 | 7            | -0.0          | 51.50                          | 564.00                        | 0.05615           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 435.00                        | 0.04973           |
| DESCENT     | ON              | 8            | -0.0          | 38.30                          | 382.00                        | 0.05666           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 249.00                        | 0.05008           |
| TAXI        |                 | 10           | -0.0          | 8.10                           | 89.00                         | 0.05085           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 247.00                              | -0.00                              | 3.30                   | 5.80                          | 1596.00              | 63.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 2            | 370.00                              | -0.00                              | 5.70                   | 4.30                          | 1241.00              | 40.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 3            | 639.00                              | -0.00                              | 4.70                   | 5.50                          | 768.00               | 227.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 560.00                              | -0.00                              | 4.40                   | 5.20                          | 946.00               | 144.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 695.00                              | -0.00                              | 4.80                   | 5.50                          | 709.00               | 159.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1099.00                             | -0.00                              | 7.00                   | 4.90                          | 591.00               | 174.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1099.00                             | -0.00                              | 7.00                   | 4.90                          | 591.00               | 174.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1087.00                             | -0.00                              | 4.60                   | 6.00                          | 552.00               | 338.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 975.00                              | -0.00                              | 3.10                   | 3.80                          | 1025.00              | 50.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 9            | 874.00                              | -0.00                              | 5.70                   | 4.90                          | 729.00               | 179.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 471.00                              | -0.00                              | 6.20                   | 4.50                          | 1143.00              | 53.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 719.99                             | 19.94                              | 0.0                                 | 1988.27                             | 2.26                               | 2.26                                | 4607.90                 | 127.63                  | 0.0                      | 12724.94                 | 14.45                   | 14.45                    |
| 2            | 1137.42                            | 14.18                              | 0.0                                 | 1348.19                             | 1.31                               | 1.31                                | 11146.70                | 138.99                  | 0.0                      | 13212.29                 | 12.85                   | 12.85                    |
| 3            | 923.94                             | 8.65                               | 0.0                                 | 1698.81                             | 7.33                               | 7.33                                | 17831.94                | 166.88                  | 0.0                      | 32787.02                 | 141.46                  | 141.46                   |
| 4            | 916.91                             | 11.29                              | 0.0                                 | 1702.60                             | 4.93                               | 4.93                                | 15312.31                | 188.55                  | 0.0                      | 28433.48                 | 82.31                   | 82.31                    |
| 5            | 935.03                             | 7.91                               | 0.0                                 | 1683.40                             | 5.09                               | 5.09                                | 15615.03                | 132.10                  | 0.0                      | 28112.71                 | 84.96                   | 84.96                    |
| 6            | 1182.50                            | 5.72                               | 0.0                                 | 1300.58                             | 4.83                               | 4.83                                | 60898.79                | 294.47                  | 0.0                      | 66979.94                 | 248.65                  | 248.65                   |
| 7            | 1182.50                            | 5.72                               | 0.0                                 | 1300.58                             | 4.83                               | 4.83                                | 60898.79                | 294.47                  | 0.0                      | 66979.94                 | 248.65                  | 248.65                   |
| 8            | 872.16                             | 5.99                               | 0.0                                 | 1787.43                             | 10.53                              | 10.53                               | 30961.79                | 212.79                  | 0.0                      | 63453.49                 | 373.68                  | 373.68                   |
| 8            | 1363.37                            | 9.88                               | 0.0                                 | 1004.97                             | 1.38                               | 1.38                                | 52217.22                | 378.44                  | 0.0                      | 38490.22                 | 52.94                   | 52.94                    |
| 9            | 1078.93                            | 7.90                               | 0.0                                 | 1457.32                             | 5.57                               | 5.57                                | 23736.51                | 173.87                  | 0.0                      | 32060.96                 | 122.44                  | 122.44                   |
| 10           | 1158.23                            | 12.23                              | 0.0                                 | 1320.85                             | 1.63                               | 1.63                                | 9381.67                 | 99.06                   | 0.0                      | 10698.90                 | 13.17                   | 13.17                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 9.80                           | 1.96                 | 1137.42                | 11146.70             | 2.229                  | 14.18                  | 138.99               | 0.028                  | 1.31                   | 12.85                | 0.0026                 |
| 6                       | 0.30                    | 51.50                          | 0.26                 | 1182.50                | 60898.79             | 0.304                  | 5.72                   | 294.47               | 0.001                  | 4.83                   | 248.65               | 0.0012                 |
| 7                       | 5.00                    | 51.50                          | 4.27                 | 1182.50                | 60898.79             | 5.055                  | 5.72                   | 294.47               | 0.024                  | 4.83                   | 248.65               | 0.0206                 |
| 9                       | 5.00                    | 22.00                          | 2.20                 | 1078.93                | 23736.51             | 2.374                  | 7.90                   | 173.87               | 0.017                  | 5.57                   | 122.44               | 0.0122                 |
| 10                      | 4.00                    | 8.10                           | 0.54                 | 1158.23                | 9381.67              | 0.629                  | 12.23                  | 99.06                | 0.007                  | 1.43                   | 13.17                | 0.0009                 |
| TOTAL FOR CYCLE         |                         |                                | 9.235                |                        |                      | 10.591                 |                        |                      | 0.078                  |                        |                      | 0.0376                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.147                  |                        |                      | 0.008                  |                        |                      | 0.0041                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 168 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 204598-9-AC

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 284. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 30.02 FINISH 30.02

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.0C, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.90                           | 47.00                         | 0.03758           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.90                           | 98.00                         | 0.04163           |
| RUN UP      |                 | 3            | -0.0          | 16.7C                          | 198.00                        | 0.04540           |
| RUN UP-LEAN |                 | 4            | -0.0          | 16.70                          | 199.00                        | 0.04448           |
| RUN UP-RICH |                 | 5            | -0.0          | 16.7C                          | 201.00                        | 0.04487           |
| TAKE-OFF    |                 | 6            | -0.0          | 50.60                          | 570.00                        | 0.05055           |
| CLIMB       |                 | 7            | -0.0          | 50.60                          | 570.00                        | 0.05055           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 434.00                        | 0.04653           |
| DESCENT     |                 | 8            | -0.0          | 44.80                          | 453.00                        | 0.05293           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 247.00                        | 0.04735           |
| TAXI        |                 | 10           | -0.0          | 8.10                           | 89.00                         | 0.04622           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGRFES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 291.00                              | -0.00                              | 3.20                     | 4.60                          | 2060.00              | 30.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 2            | 437.00                              | -0.00                              | 5.00                     | 3.70                          | 1268.00              | 37.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 3            | 762.00                              | -0.00                              | 4.60                     | 5.00                          | 849.00               | 290.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 695.00                              | -0.00                              | 4.40                     | 5.00                          | 881.00               | 132.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 796.00                              | -0.00                              | 4.30                     | 5.20                          | 810.00               | 174.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1256.00                             | -0.00                              | 5.90                     | 4.80                          | 669.00               | 181.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1256.00                             | -0.00                              | 5.90                     | 4.80                          | 669.00               | 181.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 4.30                     | 5.60                          | 528.00               | 311.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1099.00                             | -0.00                              | 7.40                     | 3.70                          | 1109.00              | 76.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 998.00                              | -0.00                              | 5.50                     | 4.50                          | 740.00               | 142.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 583.00                              | -0.00                              | 5.70                     | 4.00                          | 1109.00              | 44.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 807.49                             | 29.77                              | 0.0                                 | 1823.82                             | 1.24                               | 1.24                                | 3149.20                 | 116.11                  | 0.0                      | 7112.90                  | 4.45                    | 4.85                     |
| 2            | 1144.38                            | 16.62                              | 0.0                                 | 1330.57                             | 1.39                               | 1.39                                | 10184.94                | 147.93                  | 0.0                      | 11842.09                 | 12.18                   | 12.38                    |
| 3            | 959.58                             | 10.10                              | 0.0                                 | 1638.83                             | 6.85                               | 6.85                                | 16025.02                | 168.59                  | 0.0                      | 27368.39                 | 114.44                  | 114.44                   |
| 4            | 936.86                             | 10.74                              | 0.0                                 | 1672.75                             | 4.62                               | 4.62                                | 15645.57                | 179.42                  | 0.0                      | 27934.92                 | 77.10                   | 77.10                    |
| 5            | 906.69                             | 9.78                               | 0.0                                 | 1722.79                             | 6.03                               | 6.03                                | 15141.74                | 163.36                  | 0.0                      | 28770.60                 | 100.64                  | 100.64                   |
| 6            | 1107.04                            | 7.19                               | 0.0                                 | 1415.11                             | 5.58                               | 5.58                                | 56016.20                | 363.78                  | 0.0                      | 71604.61                 | 282.27                  | 282.27                   |
| 7            | 1107.04                            | 7.19                               | 0.0                                 | 1415.11                             | 5.58                               | 5.58                                | 56016.20                | 363.78                  | 0.0                      | 71604.63                 | 282.27                  | 282.27                   |
| 8            | 872.82                             | 6.14                               | 0.0                                 | 1786.01                             | 10.37                              | 10.37                               | 30985.12                | 217.90                  | 0.0                      | 63403.21                 | 368.10                  | 368.10                   |
| 8            | 1333.50                            | 11.45                              | 0.0                                 | 1047.61                             | 2.25                               | 2.25                                | 59740.81                | 512.76                  | 0.0                      | 46933.11                 | 100.78                  | 100.78                   |
| 9            | 1102.97                            | 8.50                               | 0.0                                 | 1417.92                             | 4.68                               | 4.68                                | 24265.27                | 186.98                  | 0.0                      | 31194.17                 | 102.90                  | 102.90                   |
| 10           | 1173.73                            | 13.08                              | 0.0                                 | 1294.17                             | 1.49                               | 1.49                                | 9507.20                 | 105.94                  | 0.0                      | 10482.77                 | 12.05                   | 12.05                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.90                           | 1.78                 | 1144.38                | 10184.94             | 2.037                  | 16.62                  | 147.93               | 0.030                  | 1.39                   | 12.38                | 0.0025                 |
| 4                       | 0.30                    | 50.60                          | 0.25                 | 1107.04                | 56016.20             | 0.280                  | 7.19                   | 363.78               | 0.002                  | 5.58                   | 282.27               | 0.0014                 |
| 7                       | 5.00                    | 50.60                          | 4.20                 | 1107.04                | 56016.20             | 4.649                  | 7.19                   | 363.78               | 0.030                  | 5.58                   | 282.27               | 0.0234                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1102.97                | 24265.27             | 2.427                  | 8.50                   | 186.98               | 0.019                  | 4.68                   | 102.90               | 0.0103                 |
| 10                      | 4.00                    | 8.10                           | 0.54                 | 1173.73                | 9507.20              | 0.637                  | 13.08                  | 105.94               | 0.007                  | 1.49                   | 12.05                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 8.975                |                        |                      | 10.030                 |                        |                      | 0.087                  |                        |                      | 0.0384                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.117                  |                        |                      | 0.010                  |                        |                      | 0.0043                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 169 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 213378-71AA

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 43. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 70.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 30.24 FINISH 30.23

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 76.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARR.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.60                           | 63.00                         | 0.06193           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.10                           | 94.00                         | 0.05667           |
| RUN UP      |                 | 3            | -0.0          | 12.40                          | 135.00                        | 0.05928           |
| RUN UP-LEAN |                 | 4            | -0.0          | 13.20                          | 145.00                        | 0.05478           |
| RUN UP-RICH |                 | 5            | -0.0          | 14.10                          | 163.00                        | 0.06449           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 540.00                        | 0.07863           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 540.00                        | 0.07863           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 428.00                        | 0.06745           |
| DESCENT     | ON              | 8            | -0.0          | 44.80                          | 481.00                        | 0.07723           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 239.00                        | 0.06975           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 66.00                         | 0.05836           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 258.00                              | -0.00                              | 6.10                     | 6.50                          | 6911.00              | 11.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 2            | 314.00                              | -0.00                              | 5.70                     | 6.10                          | 3415.00              | 33.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 3            | 560.00                              | -0.00                              | 7.00                     | 5.40                          | 2555.00              | 92.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 493.00                              | -0.00                              | 6.40                     | 5.00                          | 2770.00              | 64.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 605.00                              | -0.00                              | 6.80                     | 6.80                          | 2555.00              | 70.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1121.00                             | -0.00                              | 9.80                     | 6.90                          | 1802.00              | 148.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1121.00                             | -0.00                              | 9.80                     | 6.90                          | 1802.00              | 148.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1054.00                             | -0.00                              | 6.50                     | 7.90                          | 1640.00              | 213.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1043.00                             | -0.00                              | 9.80                     | 6.50                          | 2501.00              | 569.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 819.00                              | -0.00                              | 8.60                     | 6.10                          | 2286.00              | 74.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 392.00                              | -0.00                              | 5.60                     | 6.70                          | 2393.00              | 47.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 927.19                             | 60.16                              | 0.0                                 | 1552.36                             | 0.27                               | 0.27                                | 5192.29                 | 336.91                  | 0.0                      | 8643.21                  | 1.54                    | 1.54                     |
| 2            | 948.43                             | 32.54                              | 0.0                                 | 1594.77                             | 0.90                               | 0.90                                | 7682.27                 | 263.60                  | 0.0                      | 12917.63                 | 7.31                    | 7.31                     |
| 3            | 1117.43                            | 23.36                              | 0.0                                 | 1354.42                             | 2.41                               | 2.41                                | 13856.14                | 289.65                  | 0.0                      | 16744.84                 | 29.91                   | 29.91                    |
| 4            | 1107.26                            | 27.45                              | 0.0                                 | 1359.19                             | 1.82                               | 1.82                                | 14615.86                | 362.30                  | 0.0                      | 17941.24                 | 24.01                   | 24.01                    |
| 5            | 991.49                             | 21.34                              | 0.0                                 | 1557.85                             | 1.68                               | 1.68                                | 13980.02                | 300.84                  | 0.0                      | 21965.73                 | 23.64                   | 23.64                    |
| 6            | 1172.87                            | 12.35                              | 0.0                                 | 1297.51                             | 2.91                               | 2.91                                | 58174.41                | 612.64                  | 0.0                      | 64356.58                 | 144.31                  | 144.31                   |
| 7            | 1172.87                            | 12.35                              | 0.0                                 | 1297.51                             | 2.91                               | 2.91                                | 58174.41                | 612.64                  | 0.0                      | 64356.58                 | 144.31                  | 144.31                   |
| 8            | 901.64                             | 13.03                              | 0.0                                 | 1721.82                             | 5.31                               | 5.31                                | 32008.31                | 462.53                  | 0.0                      | 61124.42                 | 188.46                  | 188.46                   |
| 8            | 1196.27                            | 17.48                              | 0.0                                 | 1246.67                             | 11.41                              | 11.41                               | 53592.65                | 783.32                  | 0.0                      | 55850.98                 | 511.11                  | 511.11                   |
| 9            | 1163.81                            | 17.72                              | 0.0                                 | 1297.03                             | 1.64                               | 1.64                                | 25603.76                | 389.79                  | 0.0                      | 28534.71                 | 36.19                   | 36.19                    |
| 10           | 902.23                             | 22.08                              | 0.0                                 | 1696.06                             | 1.24                               | 1.24                                | 5052.48                 | 123.65                  | 0.0                      | 9497.94                  | 6.97                    | 6.97                     |

## LIU CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 948.43                 | 7682.27              | 1.536                  | 32.54                  | 263.60               | 0.053                  | 0.90                   | 7.31                 | 0.0015                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1172.87                | 58174.41             | 0.291                  | 12.35                  | 612.64               | 0.003                  | 2.91                   | 144.31               | 0.0007                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1172.87                | 58174.41             | 4.878                  | 12.35                  | 612.64               | 0.051                  | 2.91                   | 144.31               | 0.0120                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1163.81                | 25603.76             | 2.560                  | 17.72                  | 389.79               | 0.039                  | 1.64                   | 36.19                | 0.0036                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 902.23                 | 5052.48              | 0.339                  | 22.08                  | 123.65               | 0.008                  | 1.24                   | 6.97                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 8.560                |                        |                      | 9.555                  |                        |                      | 0.154                  |                        |                      | 0.0182                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.116                  |                        |                      | 0.018                  |                        |                      | 0.0021                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEOYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 170 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 21378-71A8

RATE HORSEPOWER: 100.

ENGINE TOTAL TIME: 43. MRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 30.23 FINISH 30.23

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 75.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARR.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.90                           | 46.00                         | 0.05391           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.10                           | 97.00                         | 0.05477           |
| RUN UP      |                 | 3            | -0.0          | 15.00                          | 181.00                        | 0.06011           |
| RUN UP-LEAN |                 | 4            | -0.0          | 13.20                          | 161.00                        | 0.05534           |
| RUN UP-RICH |                 | 5            | -0.0          | 13.20                          | 159.00                        | 0.06053           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 539.00                        | 0.07689           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 539.00                        | 0.07689           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 425.00                        | 0.06752           |
| DESCENT     | ON              | 8            | -0.0          | 42.00                          | 451.00                        | 0.07628           |
| APPROACH    |                 | 9            | -0.0          | 20.20                          | 220.00                        | 0.06836           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 76.00                         | 0.05654           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 179.00                              | -0.00                              | 4.70                     | 6.40                          | 4699.00              | 15.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 2            | 280.00                              | -0.00                              | 4.90                     | 6.50                          | 3593.00              | 50.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 3            | 527.00                              | -0.00                              | 5.50                     | 7.20                          | 2432.00              | 170.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 471.00                              | -0.00                              | 4.80                     | 6.80                          | 2985.00              | 101.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 583.00                              | -0.00                              | 5.70                     | 7.10                          | 2266.00              | 120.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1076.00                             | -0.00                              | 9.60                     | 6.70                          | 1935.00              | 181.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1076.00                             | -0.00                              | 9.60                     | 6.70                          | 1935.00              | 181.00              | -0.00                    | -0.00                    | 6.00               | -3.00 | -0.00        |
| 8            | 1054.00                             | -0.00                              | 6.60                     | 7.80                          | 1714.00              | 255.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1031.00                             | -0.00                              | 9.60                     | 6.50                          | 2487.00              | 627.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8.30                     | 6.10                          | 2322.00              | 94.00               | -0.00                    | -0.00                    | 6.00               | -3.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 5.40                     | 6.50                          | 2377.00              | 54.00               | -0.00                    | -0.00                    | 10.00              | -3.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 820.67                             | 46.99                              | 0.0                                 | 1755.86                             | 0.43                               | 0.43                                | 1200.62                 | 183.27                  | 0.0                      | 6847.96                  | 1.68                    | 1.68                     |
| 2            | 841.81                             | 35.35                              | 0.0                                 | 1754.58                             | 1.41                               | 1.41                                | 6818.70                 | 286.36                  | 0.0                      | 14212.06                 | 11.43                   | 11.43                    |
| 3            | 358.47                             | 21.74                              | 0.0                                 | 1765.76                             | 4.36                               | 4.36                                | 17876.98                | 326.11                  | 0.0                      | 26486.33                 | 65.38                   | 65.38                    |
| 4            | 814.99                             | 29.03                              | 0.0                                 | 1814.08                             | 2.82                               | 2.82                                | 10757.83                | 383.15                  | 0.0                      | 23945.86                 | 37.18                   | 37.18                    |
| 5            | 883.99                             | 20.13                              | 0.0                                 | 1730.09                             | 3.06                               | 3.06                                | 11668.62                | 265.67                  | 0.0                      | 22837.11                 | 40.35                   | 40.35                    |
| 6            | 1175.87                            | 13.57                              | 0.0                                 | 1289.44                             | 3.64                               | 3.64                                | 58323.27                | 673.28                  | 0.0                      | 63956.31                 | 180.62                  | 180.62                   |
| 7            | 1175.87                            | 13.57                              | 0.0                                 | 1289.44                             | 3.64                               | 3.64                                | 58323.27                | 673.28                  | 0.0                      | 63956.31                 | 180.62                  | 180.62                   |
| 8            | 915.05                             | 13.61                              | 0.0                                 | 1699.16                             | 5.81                               | 5.81                                | 32484.23                | 483.15                  | 0.0                      | 60320.04                 | 206.15                  | 206.15                   |
| 8            | 1186.29                            | 17.60                              | 0.0                                 | 1262.03                             | 12.73                              | 12.73                               | 49824.06                | 739.25                  | 0.0                      | 53005.34                 | 534.51                  | 534.51                   |
| 9            | 1145.96                            | 18.36                              | 0.0                                 | 1323.31                             | 2.13                               | 2.13                                | 23144.42                | 370.90                  | 0.0                      | 26730.77                 | 43.06                   | 43.06                    |
| 10           | 898.79                             | 22.66                              | 0.0                                 | 1699.88                             | 1.48                               | 1.48                                | 5752.27                 | 145.02                  | 0.0                      | 10879.20                 | 9.45                    | 9.45                     |

#### LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 841.81                 | 6818.70              | 1.364                  | 35.35                  | 286.36               | 0.057                  | 1.41                   | 11.43                | 0.0023                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1175.87                | 58323.27             | 0.292                  | 13.57                  | 673.28               | 0.003                  | 3.64                   | 180.62               | 0.0009                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1175.87                | 58323.27             | 4.841                  | 13.57                  | 673.28               | 0.056                  | 3.64                   | 180.62               | 0.0150                 |
| 9                       | 6.00                    | 20.20                          | 2.07                 | 1145.96                | 23148.42             | 2.315                  | 18.36                  | 370.90               | 0.037                  | 2.13                   | 43.06                | 0.0043                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 898.79                 | 5752.27              | 0.385                  | 22.66                  | 145.02               | 0.010                  | 1.48                   | 9.45                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 8.434                |                        |                      | 9.196                  |                        |                      | 0.163                  |                        |                      | 0.0231                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.090                  |                        |                      | 0.019                  |                        |                      | 0.0027                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 171 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 213378-71AC  
 RATED HORSEPOWER: 100.  
 ENGINE TOTAL TIME: 44. HRS  
 FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 75.50  
 ATMOSPHERIC PRESSURE: START 30.23 FINISH 30.23  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 73.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.90                           | 46.00                         | 0.05636           |
| IDLE/TAXI   |                 | 2            | -0.0          | 6.40                           | 75.00                         | 0.06201           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 156.00                        | 0.06545           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.00                          | 178.00                        | 0.06318           |
| RUN UP-RICH |                 | 5            | -0.0          | 12.40                          | 147.00                        | 0.06626           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 553.00                        | 0.07795           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 553.00                        | 0.07795           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 425.00                        | 0.07044           |
| DESCENT     | ON              | 8            | -0.0          | 42.00                          | 422.00                        | 0.08328           |
| APPROACH    |                 | 9            | -0.0          | 21.10                          | 228.00                        | 0.07568           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 64.00                         | 0.06894           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(CRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(CRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 5.00                     | 6.70                          | 4124.00              | 15.00               | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 6.00                     | 7.00                          | 3385.00              | 49.00               | -0.00                    | -0.00                    | 16.00              | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 6.50                     | 7.30                          | 2954.00              | 142.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 6.00                     | 7.30                          | 3077.00              | 85.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | -0.00                               | -0.00                              | 6.40                     | 7.60                          | 2893.00              | 99.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 9.10                     | 7.40                          | 2770.00              | 203.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 9.10                     | 7.40                          | 2770.00              | 203.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 6.80                     | 8.20                          | 2277.00              | 287.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 11.70                    | 5.80                          | 2770.00              | 178.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 9.40                     | 6.60                          | 2277.00              | 89.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 7.40                     | 7.20                          | 2339.00              | 52.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/PP | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 833.95                             | 39.39                              | 0.0                                 | 1755.84                             | 0.41                               | 0.41                                | 3252.42                 | 153.64                  | 0.0                      | 6847.77                  | 1.60                    | 1.60                     |
| 2            | 908.75                             | 29.36                              | 0.0                                 | 1665.83                             | 1.22                               | 1.22                                | 5816.02                 | 187.92                  | 0.0                      | 10661.12                 | 7.00                    | 7.80                     |
| 3            | 931.62                             | 24.25                              | 0.0                                 | 1643.94                             | 3.34                               | 3.34                                | 12297.36                | 320.08                  | 0.0                      | 21699.96                 | 44.13                   | 44.13                    |
| 4            | 890.78                             | 26.16                              | 0.0                                 | 1702.86                             | 2.07                               | 2.07                                | 13361.63                | 392.45                  | 0.0                      | 25542.84                 | 31.09                   | 31.09                    |
| 5            | 904.84                             | 23.43                              | 0.0                                 | 1688.27                             | 2.30                               | 2.30                                | 11219.99                | 290.47                  | 0.0                      | 20934.58                 | 28.51                   | 28.51                    |
| 6            | 1095.79                            | 19.10                              | 0.0                                 | 1400.09                             | 4.02                               | 4.02                                | 54351.18                | 947.53                  | 0.0                      | 69444.63                 | 199.15                  | 199.15                   |
| 7            | 1045.79                            | 19.10                              | 0.0                                 | 1400.09                             | 4.02                               | 4.02                                | 54351.18                | 947.53                  | 0.0                      | 69444.63                 | 199.15                  | 199.15                   |
| 8            | 902.15                             | 17.30                              | 0.0                                 | 1709.31                             | 6.25                               | 6.25                                | 32026.15                | 614.19                  | 0.0                      | 60680.34                 | 222.02                  | 222.02                   |
| 8            | 1329.63                            | 18.03                              | 0.0                                 | 1035.64                             | 3.12                               | 3.12                                | 55844.25                | 757.21                  | 0.0                      | 43496.96                 | 139.55                  | 139.55                   |
| 9            | 1170.23                            | 16.24                              | 0.0                                 | 1291.00                             | 1.82                               | 1.82                                | 24691.92                | 342.56                  | 0.0                      | 27240.13                 | 38.40                   | 38.40                    |
| 10           | 1007.81                            | 18.24                              | 0.0                                 | 1540.70                             | 1.16                               | 1.16                                | 5643.73                 | 102.17                  | 0.0                      | 8627.90                  | 6.51                    | 6.51                     |

LTU CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| 2                       | 12.00                   | 6.40                           | 1.28                 | 908.75                 | 5816.02                | 1.163                  | 29.36                  | 187.92                 | 0.038                  |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1095.79                | 54351.38               | 0.272                  | 19.10                  | 947.53                 | 0.005                  |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1095.79                | 54351.38               | 4.511                  | 19.10                  | 947.53                 | 0.079                  |
| 9                       | 6.00                    | 21.10                          | 2.11                 | 1170.23                | 24691.92               | 2.469                  | 16.24                  | 342.56                 | 0.034                  |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 1007.81                | 5643.73                | 0.373                  | 18.24                  | 102.17                 | 0.007                  |
| TOTAL FOR CYCLE         |                         |                                | 8.130                |                        |                        | 8.793                  |                        |                        | 0.162                  |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                        | 1.082                  |                        |                        | 0.0029                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 172 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 205317-9-AA

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 289. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.50 FINISH 78.00

ATMOSPHERIC PRESSURE: START 30.30 FINISH 30.30

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 67.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 52.00                         | 0.06634           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.10                           | 90.00                         | 0.06347           |
| RUN UP      |                 | 3            | -0.0          | 16.70                          | 191.00                        | 0.06990           |
| RUN UP-LEAN |                 | 4            | -0.0          | 16.70                          | 195.00                        | 0.06525           |
| RUN UP-RICH |                 | 5            | -0.0          | 15.80                          | 180.00                        | 0.06986           |
| TAKE-OFF    |                 | 6            | -0.0          | 50.60                          | 544.00                        | 0.08577           |
| CLIMB       |                 | 7            | -0.0          | 50.60                          | 544.00                        | 0.08577           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 419.00                        | 0.07344           |
| DESCENT     | ON              | 8            | -0.0          | 44.80                          | 468.00                        | 0.08624           |
| APPROACH    |                 | 9            | -0.0          | 22.90                          | 250.00                        | 0.07326           |
| TAXI        |                 | 10           | -0.0          | 7.20                           | 84.00                         | 0.06710           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 247.00                              | -0.00                              | 6.90                   | 6.60                          | 7396.00              | 9.00                | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 2            | 336.00                              | -0.00                              | 7.30                   | 6.00                          | 2853.00              | 27.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 3            | 572.00                              | -0.00                              | 7.70                   | 7.10                          | 2325.00              | 84.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 538.00                              | -0.00                              | 6.70                   | 7.10                          | 2377.00              | 78.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 594.00                              | -0.00                              | 7.80                   | 7.00                          | 2166.00              | 64.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1065.00                             | -0.00                              | 10.90                  | 7.30                          | 2377.00              | 409.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1065.00                             | -0.00                              | 10.90                  | 7.30                          | 2377.00              | 409.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1009.00                             | -0.00                              | 7.60                   | 8.10                          | 1638.00              | 186.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 986.00                              | -0.00                              | 11.30                  | 6.80                          | 3962.00              | 473.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 807.00                              | -0.00                              | 8.90                   | 6.60                          | 2113.00              | 74.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 10           | 381.00                              | -0.00                              | 7.20                   | 7.00                          | 2272.00              | 43.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 978.93                             | 60.10                              | 0.0                                 | 1471.25                             | 0.21                               | 0.21                                | 4600.98                 | 782.45                  | 0.0                      | 6914.86                  | 0.99                    | 0.99                     |
| 2            | 1085.56                            | 24.30                              | 0.0                                 | 1401.92                             | 0.66                               | 0.66                                | 8793.07                 | 196.82                  | 0.0                      | 11355.52                 | 5.34                    | 5.34                     |
| 3            | 1034.81                            | 17.90                              | 0.0                                 | 1499.23                             | 1.85                               | 1.85                                | 17281.34                | 298.85                  | 0.0                      | 25037.06                 | 30.97                   | 30.97                    |
| 4            | 964.23                             | 19.59                              | 0.0                                 | 1605.47                             | 1.84                               | 1.84                                | 16102.63                | 327.19                  | 0.0                      | 26811.36                 | 30.79                   | 30.79                    |
| 5            | 1049.36                            | 16.69                              | 0.0                                 | 1479.68                             | 1.41                               | 1.41                                | 16579.89                | 263.69                  | 0.0                      | 23378.88                 | 22.35                   | 22.35                    |
| 6            | 1194.32                            | 14.92                              | 0.0                                 | 1256.77                             | 7.36                               | 7.36                                | 60432.72                | 754.78                  | 0.0                      | 63592.62                 | 372.47                  | 372.47                   |
| 7            | 1194.32                            | 14.92                              | 0.0                                 | 1256.77                             | 7.36                               | 7.36                                | 60432.72                | 754.78                  | 0.0                      | 63592.62                 | 372.47                  | 372.47                   |
| 8            | 967.85                             | 11.95                              | 0.0                                 | 1620.76                             | 3.89                               | 3.89                                | 34356.69                | 424.11                  | 0.0                      | 57536.85                 | 138.12                  | 138.12                   |
| 8            | 1234.23                            | 24.78                              | 0.0                                 | 1166.99                             | 8.49                               | 8.49                                | 55293.67                | 1110.34                 | 0.0                      | 52281.05                 | 380.17                  | 380.17                   |
| 9            | 1144.41                            | 15.56                              | 0.0                                 | 1333.44                             | 1.56                               | 1.56                                | 26206.86                | 356.34                  | 0.0                      | 30535.66                 | 35.79                   | 35.79                    |
| 10           | 1008.21                            | 18.22                              | 0.0                                 | 1540.13                             | 0.99                               | 0.99                                | 7259.13                 | 131.19                  | 0.0                      | 11088.90                 | 7.12                    | 7.12                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 1085.56                | 8793.07              | 1.759                  | 24.30                  | 196.82               | 0.039                  | 0.66                   | 5.34                 | 0.0011                 |
| 6                       | 0.30                    | 50.60                          | 0.25                 | 1194.32                | 60432.72             | 0.302                  | 14.92                  | 754.78               | 0.004                  | 7.36                   | 372.47               | 0.0019                 |
| 7                       | 5.00                    | 50.60                          | 4.20                 | 1194.32                | 60432.72             | 5.016                  | 14.92                  | 754.78               | 0.063                  | 7.36                   | 372.47               | 0.0309                 |
| 9                       | 6.00                    | 22.90                          | 2.29                 | 1144.41                | 26206.86             | 2.621                  | 15.56                  | 356.34               | 0.036                  | 1.56                   | 35.79                | 0.0036                 |
| 10                      | 4.00                    | 7.20                           | 0.48                 | 1008.21                | 7259.13              | 0.486                  | 18.22                  | 131.19               | 0.009                  | 0.99                   | 7.12                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 9.845                |                        |                      | 10.184                 |                        |                      | 0.150                  |                        |                      | 0.0379                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.151                  |                        |                      | 0.017                  |                        |                      | 0.0043                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 173 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 205317-9-AB

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 299. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 78.50

ATMOSPHERIC PRESSURE: START 30.28 FINISH 30.28

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.90                           | 45.00                         | 0.06132           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 84.00                         | 0.06149           |
| RUN UP      |                 | 3            | -0.0          | 16.70                          | 194.00                        | 0.06616           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.80                          | 185.00                        | 0.06338           |
| RUN UP-RICH |                 | 5            | -0.0          | 14.10                          | 170.00                        | 0.06394           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 537.00                        | 0.08339           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 537.00                        | 0.08339           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 420.00                        | 0.07207           |
| DESCENT     | ON              | 9            | -0.0          | 44.80                          | 465.00                        | 0.08250           |
| APPROACH    |                 | 10           | -0.0          | 22.00                          | 239.00                        | 0.07061           |
| TAXI        |                 |              |               | 6.40                           | 74.00                         | 0.06348           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 202.00                              | -0.00                              | 5.60                     | 7.00                          | 5916.00              | 17.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 2            | 336.00                              | -0.00                              | 6.30                     | 6.70                          | 2497.00              | 41.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 3            | 560.00                              | -0.00                              | 6.90                     | 7.10                          | 2334.00              | 104.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 527.00                              | -0.00                              | 6.30                     | 7.00                          | 3311.00              | 83.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 577.00                              | -0.00                              | 6.00                     | 7.60                          | 1900.00              | 83.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1054.00                             | -0.00                              | 10.50                    | 7.20                          | 2225.00              | 292.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1054.00                             | -0.00                              | 10.50                    | 7.20                          | 2225.00              | 292.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1020.00                             | -0.00                              | 7.40                     | 8.00                          | 1628.00              | 193.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 9            | 1009.00                             | -0.00                              | 11.10                    | 6.30                          | 2551.00              | 158.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 818.00                              | -0.00                              | 9.70                     | 6.20                          | 2171.00              | 77.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 10           | 415.00                              | -0.00                              | 6.70                     | 6.70                          | 2334.00              | 43.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 857.62                             | 51.89                              | 0.0                                 | 1684.38                             | 0.43                               | 0.43                                | 3344.70                 | 202.37                  | 0.0                      | 6569.09                  | 1.67                    | 1.67                     |
| 2            | 960.59                             | 21.81                              | 0.0                                 | 1605.12                             | 1.03                               | 1.03                                | 6916.22                 | 157.00                  | 0.0                      | 11556.89                 | 7.39                    | 7.39                     |
| 3            | 979.36                             | 18.97                              | 0.0                                 | 1583.40                             | 2.42                               | 2.42                                | 16355.30                | 316.85                  | 0.0                      | 26442.71                 | 40.49                   | 40.49                    |
| 4            | 933.71                             | 28.10                              | 0.0                                 | 1630.07                             | 2.02                               | 2.02                                | 14752.60                | 444.05                  | 0.0                      | 25755.14                 | 31.92                   | 31.92                    |
| 5            | 879.00                             | 15.94                              | 0.0                                 | 1749.40                             | 2.00                               | 2.00                                | 12393.90                | 224.78                  | 0.0                      | 24666.53                 | 28.16                   | 28.16                    |
| 6            | 1183.57                            | 14.36                              | 0.0                                 | 1275.19                             | 5.41                               | 5.41                                | 58704.88                | 712.46                  | 0.0                      | 63249.28                 | 268.16                  | 268.16                   |
| 7            | 1183.57                            | 14.36                              | 0.0                                 | 1275.19                             | 5.41                               | 5.41                                | 58704.88                | 712.46                  | 0.0                      | 63249.28                 | 268.16                  | 268.16                   |
| 8            | 960.61                             | 12.10                              | 0.0                                 | 1631.71                             | 4.12                               | 4.12                                | 34101.55                | 429.68                  | 0.0                      | 57925.40                 | 146.09                  | 146.09                   |
| 9            | 1270.15                            | 16.72                              | 0.0                                 | 1132.69                             | 2.97                               | 2.97                                | 56902.63                | 748.97                  | 0.0                      | 50744.43                 | 133.04                  | 133.04                   |
| 10           | 1162.66                            | 16.62                              | 0.0                                 | 1301.86                             | 1.69                               | 1.69                                | 25578.50                | 365.56                  | 0.0                      | 28640.85                 | 37.18                   | 37.18                    |
| 10           | 992.82                             | 19.81                              | 0.0                                 | 1559.95                             | 1.05                               | 1.05                                | 6354.07                 | 126.77                  | 0.0                      | 9983.67                  | 6.70                    | 6.70                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|--------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2            | 12.00                   | 7.20                           | 1.44                 | 960.59                 | 6916.22              | 1.383                  | 21.81                  | 157.00               | 0.031                  | 1.03                   | 7.39                 | 0.0015                 |
| 6            | 0.30                    | 49.60                          | 0.25                 | 1183.57                | 58704.88             | 0.294                  | 14.36                  | 712.46               | 0.004                  | 5.41                   | 268.16               | 0.0013                 |
| 7            | 5.00                    | 49.60                          | 4.12                 | 1183.57                | 58704.88             | 4.873                  | 14.36                  | 712.46               | 0.059                  | 5.41                   | 268.16               | 0.0223                 |
| 9            | 6.00                    | 22.00                          | 2.20                 | 1162.66                | 25578.50             | 2.558                  | 16.62                  | 365.56               | 0.037                  | 1.69                   | 37.18                | 0.0037                 |
| 10           | 4.00                    | 6.40                           | 0.43                 | 992.82                 | 6354.07              | 0.426                  | 19.81                  | 126.77               | 0.008                  | 1.05                   | 6.70                 | 0.0004                 |

TOTAL FOR CYCLE 8.434

9.533

0.139

0.0292

TOTAL FOR CYCLE/LB FUEL

1.130

0.016

0.0035

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 174 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 205317-9-AC

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 290. MRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.50 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.28 FINISH 30.28

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 64.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.90                           | 44.00                         | 0.06605           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 82.00                         | 0.07065           |
| RUN UP      |                 | 3            | -0.0          | 15.80                          | 177.00                        | 0.07172           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.80                          | 182.00                        | 0.07008           |
| RUN UP-RICH |                 | 5            | -0.0          | 16.70                          | 186.00                        | 0.07392           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 554.00                        | 0.08237           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 554.00                        | 0.08237           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 424.00                        | 0.07565           |
| DESCENT     | ON              | 8            | -0.0          | 43.90                          | 419.00                        | 0.09084           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 234.00                        | 0.07646           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 71.00                         | 0.07296           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(CRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 224.00                              | -0.00                              | 6.10                     | 7.20                          | 9199.00              | 15.00               | -0.00                    | -0.00                    | 32.00              | -0.00 | -0.00        |
| 2            | 392.00                              | -0.00                              | 7.70                     | 7.10                          | 3935.00              | 38.00               | -0.00                    | -0.00                    | 16.00              | -0.00 | -0.00        |
| 3            | 673.00                              | -0.00                              | 8.20                     | 6.90                          | 3066.00              | 72.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 617.00                              | -0.00                              | 7.50                     | 7.30                          | 2849.00              | 65.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 717.00                              | -0.00                              | 8.60                     | 7.00                          | 2849.00              | 68.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1121.00                             | -0.00                              | 9.60                     | 7.90                          | 2632.00              | 435.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1121.00                             | -0.00                              | 9.60                     | 7.90                          | 2632.00              | 435.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1065.00                             | -0.00                              | 7.50                     | 8.70                          | 1872.00              | 208.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1020.00                             | -0.00                              | 12.90                    | 5.70                          | 7734.00              | 84.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 9            | 852.00                              | -0.00                              | 7.70                     | 6.40                          | 2795.00              | 68.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 482.00                              | -0.00                              | 8.40                     | 6.90                          | 3718.00              | 59.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 866.63                             | 74.85                              | 0.0                                 | 1607.22                             | 0.35                               | 0.35                                | 3379.87                 | 291.91                  | 0.0                      | 6268.17                  | 1.37                    | 1.37                     |
| 2            | 1023.85                            | 29.97                              | 0.0                                 | 1483.34                             | 0.83                               | 0.83                                | 7371.69                 | 215.76                  | 0.0                      | 10680.04                 | 5.98                    | 5.98                     |
| 3            | 1075.25                            | 23.03                              | 0.0                                 | 1421.62                             | 1.55                               | 1.55                                | 16988.92                | 363.81                  | 0.0                      | 22461.52                 | 24.50                   | 24.50                    |
| 4            | 1004.43                            | 21.85                              | 0.0                                 | 1536.10                             | 1.43                               | 1.43                                | 15870.03                | 345.27                  | 0.0                      | 24270.43                 | 22.59                   | 22.59                    |
| 5            | 1073.74                            | 20.75                              | 0.0                                 | 1398.79                             | 1.42                               | 1.42                                | 18255.52                | 346.55                  | 0.0                      | 23359.83                 | 23.72                   | 23.72                    |
| 6            | 1091.82                            | 17.14                              | 0.0                                 | 1411.71                             | 8.13                               | 8.13                                | 54154.37                | 850.34                  | 0.0                      | 70020.88                 | 403.06                  | 403.06                   |
| 7            | 1091.82                            | 17.14                              | 0.0                                 | 1411.71                             | 8.13                               | 8.13                                | 54154.37                | 850.34                  | 0.0                      | 70020.88                 | 403.06                  | 403.06                   |
| 8            | 924.61                             | 13.22                              | 0.0                                 | 1685.21                             | 4.21                               | 4.21                                | 32823.64                | 469.22                  | 0.0                      | 59825.01                 | 149.52                  | 149.52                   |
| 8            | 1345.20                            | 46.19                              | 0.0                                 | 933.92                              | 1.44                               | 1.44                                | 59054.12                | 2027.73                 | 0.0                      | 40999.05                 | 63.16                   | 63.16                    |
| 9            | 1196.39                            | 19.74                              | 0.0                                 | 1240.28                             | 1.38                               | 1.38                                | 26320.59                | 434.36                  | 0.0                      | 27286.13                 | 30.31                   | 30.31                    |
| 10           | 1082.84                            | 27.45                              | 0.0                                 | 1397.56                             | 1.25                               | 1.25                                | 6730.14                 | 175.68                  | 0.0                      | 8944.38                  | 8.00                    | 8.00                     |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 1023.85                | 7371.69              | 1.474                  | 29.97                  | 215.76               | 0.043                  | 0.83                   | 5.98                 | 0.0012                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1091.82                | 54154.37             | 0.271                  | 17.14                  | 850.34               | 0.004                  | 8.13                   | 403.06               | 0.0020                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1091.82                | 54154.37             | 4.495                  | 17.14                  | 850.34               | 0.071                  | 8.13                   | 403.06               | 0.0335                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1196.39                | 26320.59             | 2.632                  | 19.74                  | 434.36               | 0.043                  | 1.38                   | 30.31                | 0.0030                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 1082.84                | 6930.14              | 0.464                  | 27.45                  | 175.68               | 0.012                  | 1.25                   | 8.00                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 8.434                |                        |                      | 9.336                  |                        |                      | 0.173                  |                        |                      | 0.0402                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.107                  |                        |                      | 0.021                  |                        |                      | 0.0048                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 181 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 213 175-70-AA  
RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 311. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 29.92 FINISH 29.92

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 73.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 59.00                         | 0.05952           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 87.00                         | 0.06385           |
| RUN UP      |                 | 3            | -0.0          | 15.80                          | 200.00                        | 0.06282           |
| RUN UP-RICH |                 | 5            | -0.0          | 15.00                          | -0.00                         | 0.06402           |
| TAKE-OFF    |                 | 6            | -0.0          | 48.60                          | 513.00                        | 0.08133           |
| CLIMB       |                 | 7            | -0.0          | 48.60                          | 513.00                        | 0.08133           |
| DESCENT     | ON              | 8            | -0.0          | 40.10                          | 424.00                        | 0.07878           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 243.00                        | 0.07273           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 79.00                         | 0.06392           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.40                          | -0.00                         | 0.05756           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 314.00                              | -0.00                              | 4.30                     | 8.10                          | 4750.00              | 15.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 5.80                     | 7.60                          | 3726.00              | -0.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 628.00                              | -0.00                              | 4.70                     | 8.60                          | 3157.00              | 205.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 673.00                              | -0.00                              | 4.90                     | 8.70                          | 2816.00              | 133.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1099.00                             | -0.00                              | 10.50                    | 6.60                          | 3328.00              | 92.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1099.00                             | -0.00                              | 10.50                    | 6.60                          | 3328.00              | 92.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1031.00                             | -0.00                              | 10.00                    | 6.40                          | 3669.00              | 203.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 9            | 1087.00                             | -0.00                              | 8.50                     | 6.80                          | 3157.00              | 71.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 5.30                     | 8.20                          | 3271.00              | 58.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 4            | 670.00                              | -0.00                              | 4.50                     | 7.60                          | 3210.00              | 190.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 674.72                             | 42.69                              | 0.0                                 | 1997.00                             | 0.39                               | 0.39                                | 3171.18                 | 200.63                  | 0.0                      | 9184.89                  | 1.82                    | 1.82                     |
| 2            | 850.77                             | 31.30                              | 0.0                                 | 1751.61                             | -0.00                              | -0.00                               | 6125.56                 | 225.38                  | 0.0                      | 12611.60                 | -0.00                   | -0.00                    |
| 3            | 697.36                             | 26.83                              | 0.0                                 | 2004.93                             | 5.00                               | 5.00                                | 11018.36                | 423.88                  | 0.0                      | 31677.84                 | 78.94                   | 78.94                    |
| 5            | 713.11                             | 23.47                              | 0.0                                 | 1989.39                             | 3.18                               | 3.18                                | 10696.69                | 352.07                  | 0.0                      | 29840.83                 | 47.69                   | 47.69                    |
| 6            | 1216.81                            | 22.09                              | 0.0                                 | 1201.76                             | 1.75                               | 1.75                                | 59137.13                | 1073.49                 | 0.0                      | 58405.43                 | 85.11                   | 85.11                    |
| 7            | 1216.81                            | 22.09                              | 0.0                                 | 1201.76                             | 1.75                               | 1.75                                | 59137.13                | 1073.49                 | 0.0                      | 58405.43                 | 85.11                   | 85.11                    |
| 8            | 1204.90                            | 25.32                              | 0.0                                 | 1211.62                             | 4.02                               | 4.02                                | 48316.27                | 1015.28                 | 0.0                      | 48586.06                 | 161.11                  | 161.11                   |
| 9            | 1099.66                            | 23.39                              | 0.0                                 | 1382.25                             | 1.51                               | 1.51                                | 24192.56                | 514.61                  | 0.0                      | 30409.57                 | 33.19                   | 33.19                    |
| 10           | 774.37                             | 27.37                              | 0.0                                 | 1882.45                             | 1.39                               | 1.39                                | 4955.94                 | 175.18                  | 0.0                      | 12047.66                 | 8.91                    | 8.91                     |
| 4            | 731.91                             | 29.90                              | 0.0                                 | 1942.21                             | 5.08                               | 5.08                                | 11271.41                | 460.49                  | 0.0                      | 29910.08                 | 78.17                   | 78.17                    |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 850.77                 | 6125.56              | 1.225                  | 31.30                  | 225.38               | 0.045                  | -0.00                  | -0.00                | -0.0000                |
| 6                       | 0.30                    | 48.60                          | 0.24                 | 1216.81                | 59137.13             | 0.296                  | 22.09                  | 1073.49              | 0.005                  | 1.75                   | 85.11                | 0.0004                 |
| 7                       | 5.00                    | 48.60                          | 4.03                 | 1216.81                | 59137.13             | 4.908                  | 22.09                  | 1073.49              | 0.089                  | 1.75                   | 85.11                | 0.0071                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1099.66                | 24192.56             | 2.419                  | 23.39                  | 514.61               | 0.051                  | 1.51                   | 33.19                | 0.0033                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 774.37                 | 4955.94              | 0.332                  | 27.37                  | 175.18               | 0.012                  | 1.39                   | 8.91                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 8.346                |                        |                      | 9.180                  |                        |                      | 0.203                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.100                  |                        |                      | 0.024                  |                        |                      | -0.0000                |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 182 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 213 175-70-AB

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 311. MRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.80 FINISH 77.80

ATMOSPHERIC PRESSURE: START 29.93 FINISH 29.93

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLF-LDW    |                 | 1            | -0.0          | 4.70                           | 62.00                         | 0.05345           |
| IOLF-TAXI   |                 | 2            | -0.0          | 7.20                           | 92.00                         | 0.06146           |
| RUN UP      |                 | 3            | -0.0          | 15.00                          | 190.00                        | 0.06709           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.00                          | 191.00                        | 0.06403           |
| RUN UP-RICH |                 | 5            | -0.0          | 15.00                          | 198.00                        | 0.06310           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 515.00                        | 0.08472           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 515.00                        | 0.08472           |
| DESCENT     |                 | 8            | -0.0          | 33.70                          | 398.00                        | 0.07116           |
| DESCENT     | ON              | 8            | -0.0          | 40.10                          | 405.00                        | 0.08552           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 244.00                        | 0.07609           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 70.00                         | 0.06374           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALUMINOSES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|---------------------|-------|--------------|
| 1            | 247.00                              | -0.00                              | 2.80                   | 8.30                          | 4790.00              | 26.00               | -0.00                    | -0.00                    | 17.00               | -0.00 | -0.00        |
| 2            | 381.00                              | -0.00                              | 4.40                   | 8.60                          | 3229.00              | 60.00               | -0.00                    | -0.00                    | 9.00                | -0.00 | -0.00        |
| 3            | 684.00                              | -0.00                              | 5.00                   | 9.30                          | 2853.00              | 274.00              | -0.00                    | -0.00                    | -0.00               | -0.00 | -0.00        |
| 4            | 650.00                              | -0.00                              | 4.70                   | 8.90                          | 2960.00              | 138.00              | -0.00                    | -0.00                    | -0.00               | -0.00 | -0.00        |
| 5            | 706.00                              | -0.00                              | 3.90                   | 9.60                          | 2422.00              | 216.00              | -0.00                    | -0.00                    | -0.00               | -0.00 | -0.00        |
| 6            | 1087.00                             | -0.00                              | 10.70                  | 6.80                          | 6728.00              | 106.00              | -0.00                    | -0.00                    | -0.00               | -0.00 | -0.00        |
| 7            | 1087.00                             | -0.00                              | 10.70                  | 6.80                          | 6728.00              | 106.00              | -0.00                    | -0.00                    | 6.00                | -0.00 | -0.00        |
| 8            | 1054.00                             | -0.00                              | 6.70                   | 8.20                          | 4844.00              | 213.00              | -0.00                    | -0.00                    | 5.00                | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 10.60                  | 6.60                          | 11303.00             | 298.00              | -0.00                    | -0.00                    | 9.00                | -0.00 | -0.00        |
| 9            | 863.00                              | -0.00                              | 8.70                   | 7.00                          | 6500.00              | 81.00               | -0.00                    | -0.00                    | 4.00                | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 5.40                   | 8.40                          | -0.00                | 62.00               | -0.00                    | -0.00                    | 5.00                | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 488.53                             | 47.86                              | 0.0                                 | 2275.35                             | 0.75                               | 0.75                                | 2296.07                 | 224.96                  | 0.0                      | 10694.11                 | 3.50                    | 3.50                     |
| 2            | 667.20                             | 28.04                              | 0.0                                 | 2048.99                             | 1.49                               | 1.49                                | 4803.83                 | 201.91                  | 0.0                      | 14752.72                 | 10.76                   | 10.76                    |
| 3            | 642.56                             | 22.63                              | 0.0                                 | 2023.99                             | 6.23                               | 6.23                                | 10388.38                | 339.49                  | 0.0                      | 30359.79                 | 93.51                   | 93.51                    |
| 4            | 683.30                             | 24.65                              | 0.0                                 | 2033.01                             | 3.30                               | 3.30                                | 10249.46                | 369.69                  | 0.0                      | 30495.18                 | 49.43                   | 49.43                    |
| 5            | 573.34                             | 20.39                              | 0.0                                 | 2217.46                             | 5.22                               | 5.22                                | 8600.05                 | 305.88                  | 0.0                      | 33261.84                 | 78.24                   | 78.24                    |
| 6            | 1189.50                            | 42.84                              | 0.0                                 | 1187.76                             | 1.94                               | 1.94                                | 58999.11                | 2124.67                 | 0.0                      | 58912.67                 | 96.00                   | 96.00                    |
| 7            | 1189.50                            | 42.84                              | 0.0                                 | 1187.76                             | 1.94                               | 1.94                                | 58999.11                | 2124.67                 | 0.0                      | 58912.67                 | 96.00                   | 96.00                    |
| 8            | 879.82                             | 36.43                              | 0.0                                 | 1691.90                             | 4.59                               | 4.59                                | 29650.08                | 1227.72                 | 0.0                      | 57016.86                 | 154.83                  | 154.83                   |
| 8            | 1168.26                            | 71.35                              | 0.0                                 | 1142.92                             | 5.39                               | 5.39                                | 46847.07                | 2860.98                 | 0.0                      | 45830.95                 | 216.33                  | 216.33                   |
| 9            | 1074.99                            | 46.00                              | 0.0                                 | 1359.00                             | 1.64                               | 1.64                                | 23649.72                | 1011.96                 | 0.0                      | 29898.05                 | 36.17                   | 36.17                    |
| 10           | 790.53                             | -0.00                              | 0.0                                 | 1932.15                             | 1.49                               | 1.49                                | 4426.95                 | -0.00                   | 0.0                      | 10820.02                 | 8.35                    | 8.35                     |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 667.20                 | 4803.83              | 0.961                  | 28.04                  | 201.91               | 0.040                  | 1.49                   | 10.76                | 0.0022                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1189.50                | 58999.11             | 0.295                  | 42.84                  | 2124.67              | 0.011                  | 1.94                   | 96.00                | 0.0005                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1189.50                | 58999.11             | 4.897                  | 42.84                  | 2124.67              | 0.176                  | 1.94                   | 96.00                | 0.0080                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1074.99                | 23649.72             | 2.365                  | 46.00                  | 1011.96              | 0.101                  | 1.64                   | 36.17                | 0.0036                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 790.53                 | 4426.95              | 0.297                  | -0.00                  | -0.00                | -0.000                 | 1.49                   | 8.35                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 8.380                |                        |                      | 8.814                  |                        |                      | -0.000                 |                        |                      | 0.0148                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.052                  |                        |                      | -0.000                 |                        |                      | 0.0018                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 183 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 213 175-70-AC

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 311. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.80 FINISH 77.80

ATMOSPHERIC PRESSURE: START 29.94 FINISH 29.94

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 62.00 PERCFNT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 62.00                         | 0.04639           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 93.00                         | 0.05305           |
| RUN UP      |                 | 3            | -0.0          | 15.00                          | 194.00                        | 0.05605           |
| RUN UP-LEAN |                 | 4            | -0.0          | 14.10                          | 180.00                        | 0.05662           |
| RUN UP-RICH |                 | 5            | -0.0          | 14.10                          | 185.00                        | 0.05545           |
| TAKE-OFF    |                 | 6            | -0.0          | 47.70                          | 512.00                        | 0.07178           |
| CLIMB       |                 | 7            | -0.0          | 47.70                          | 512.00                        | 0.07178           |
| DESCENT     |                 | 8            | -0.0          | 34.60                          | 417.00                        | 0.07042           |
| DESCENT     | ON              | 8            | -0.0          | 40.10                          | 418.00                        | 0.08228           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 244.00                        | 0.07402           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 69.00                         | 0.06421           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(CRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 258.00                              | -0.00                              | 2.50                     | 7.20                          | 3007.00              | 19.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 2            | 392.00                              | -0.00                              | 3.90                     | 7.40                          | 1407.00              | 52.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 495.00                              | -0.00                              | 4.00                     | 8.00                          | 1186.00              | 298.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 661.00                              | -0.00                              | 4.30                     | 7.80                          | 1297.00              | 144.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 717.00                              | -0.00                              | 3.70                     | 8.20                          | 1021.00              | 186.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1099.00                             | -0.00                              | 9.20                     | 6.00                          | 1517.00              | 152.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1099.00                             | -0.00                              | 7.20                     | 6.00                          | 1517.00              | 152.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1054.00                             | -0.00                              | 6.60                     | 8.40                          | 2383.00              | 253.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 10.70                    | 6.50                          | 4256.00              | 234.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 9            | 863.00                              | -0.00                              | 4.60                     | 7.00                          | 3064.00              | 72.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 426.00                              | -0.00                              | 5.20                     | 8.40                          | 3022.00              | 83.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 505.02                             | 34.79                              | 0.0                                 | 2285.29                             | 0.63                               | 0.63                                | 2373.61                 | 163.51                  | 0.0                      | 10740.84                 | 2.96                    | 2.96                     |
| 2            | 688.67                             | 14.23                              | 0.0                                 | 2053.14                             | 1.51                               | 1.51                                | 4958.45                 | 102.45                  | 0.0                      | 14782.63                 | 10.46                   | 10.86                    |
| 3            | 666.82                             | 11.32                              | 0.0                                 | 2095.45                             | 8.16                               | 8.16                                | 10002.31                | 169.85                  | 0.0                      | 31431.76                 | 122.40                  | 122.40                   |
| 4            | 710.32                             | 12.27                              | 0.0                                 | 2024.50                             | 3.91                               | 3.91                                | 10015.52                | 173.02                  | 0.0                      | 28545.50                 | 55.09                   | 55.09                    |
| 5            | 622.80                             | 9.84                               | 0.0                                 | 2168.69                             | 5.14                               | 5.14                                | 8781.43                 | 138.78                  | 0.0                      | 30578.47                 | 72.51                   | 72.51                    |
| 6            | 1210.69                            | 11.43                              | 0.0                                 | 1240.61                             | 3.29                               | 3.29                                | 57749.94                | 545.37                  | 0.0                      | 59177.05                 | 156.72                  | 156.72                   |
| 7            | 1210.69                            | 11.43                              | 0.0                                 | 1240.61                             | 3.29                               | 3.29                                | 57749.94                | 545.37                  | 0.0                      | 59177.05                 | 156.72                  | 156.72                   |
| 8            | 875.00                             | 18.09                              | 0.0                                 | 1749.78                             | 5.51                               | 5.51                                | 30275.07                | 626.05                  | 0.0                      | 60542.30                 | 170.53                  | 170.63                   |
| 8            | 1226.43                            | 27.94                              | 0.0                                 | 1170.60                             | 4.41                               | 4.41                                | 49174.69                | 1120.34                 | 0.0                      | 46941.16                 | 176.66                  | 176.66                   |
| 9            | 1092.27                            | 22.29                              | 0.0                                 | 1396.90                             | 1.50                               | 1.50                                | 24029.84                | 490.33                  | 0.0                      | 30731.84                 | 33.04                   | 33.04                    |
| 10           | 755.65                             | 25.15                              | 0.0                                 | 1917.94                             | 1.98                               | 1.98                                | 4231.64                 | 140.85                  | 0.0                      | 10740.48                 | 11.09                   | 11.09                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 688.67                 | 4958.45              | 0.992                  | 14.23                  | 102.45               | 0.020                  | 1.51                   | 10.86                | 0.0022                 |
| 6                       | 0.30                    | 47.70                          | 0.24                 | 1210.69                | 57749.94             | 0.289                  | 11.43                  | 545.37               | 0.003                  | 3.29                   | 156.72               | 0.0008                 |
| 7                       | 5.00                    | 47.70                          | 3.96                 | 1210.69                | 57749.94             | 4.793                  | 11.43                  | 545.37               | 0.045                  | 3.29                   | 156.72               | 0.0130                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1092.27                | 24029.84             | 2.403                  | 22.29                  | 490.33               | 0.049                  | 1.50                   | 33.04                | 0.0033                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 755.65                 | 4231.64              | 0.284                  | 25.15                  | 140.85               | 0.009                  | 1.98                   | 11.09                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                | 8.213                |                        |                      | 8.760                  |                        |                      | 0.127                  |                        |                      | 0.0200                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.067                  |                        |                      | 0.015                  |                        |                      | 0.0024                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 184 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 199599-9-AA

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 809. HRS

FUEL: AV GAS 80/87

FUEL M/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.80 FINISH 79.80

ATMOSPHERIC PRESSURE: START 30.03 FINISH 30.03

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 53.00                         | 0.06934           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 87.00                         | 0.06558           |
| RUN UP      |                 | 3            | -0.0          | 14.10                          | 169.00                        | 0.06684           |
| RUN UP-LEAN |                 | 4            | -0.0          | 14.10                          | 170.00                        | 0.06848           |
| RUN UP-RICH |                 | 5            | -0.0          | 14.1C                          | 171.00                        | 0.06752           |
| TAKE-OFF    |                 | 6            | -0.0          | 44.80                          | 506.00                        | 0.07667           |
| CLIMB       |                 | 7            | -0.0          | 44.80                          | 506.00                        | 0.07667           |
| DESCENT     |                 | 8            | -0.0          | 38.30                          | 453.00                        | 0.06893           |
| DESCENT     | ON              | 8            | -0.0          | 36.40                          | 375.00                        | 0.07801           |
| APPROACH    |                 | 9            | -0.0          | 21.10                          | 234.00                        | 0.07099           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 68.00                         | 0.06754           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 291.00                              | -0.00                              | 7.20                     | 7.10                          | 6155.00              | 16.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 2            | 392.00                              | -0.00                              | 6.20                     | 7.70                          | 2495.00              | 32.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 661.00                              | -0.00                              | 6.40                     | 7.80                          | 2274.00              | 144.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 673.00                              | -0.00                              | 6.50                     | 8.10                          | 1996.00              | 131.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 684.00                              | -0.00                              | 6.30                     | 8.10                          | 1941.00              | 136.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1143.00                             | -0.00                              | 8.80                     | 7.50                          | 2107.00              | 237.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1143.00                             | -0.00                              | 8.80                     | 7.50                          | 2107.00              | 237.00              | -0.00                    | -0.00                    | 0.00               | -0.00 | -0.00        |
| 8            | 998.00                              | -0.00                              | 7.00                     | 7.70                          | 1664.00              | 178.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 8            | 964.00                              | -0.00                              | 10.60                    | 5.80                          | 2606.00              | 59.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | 830.00                              | -0.00                              | 8.40                     | 6.60                          | 2274.00              | 75.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 6.20                     | 8.20                          | 2052.00              | 97.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 975.21                             | 47.75                              | 0.0                                 | 1510.99                             | 0.36                               | 0.36                                | 4583.47                 | 224.41                  | 0.0                      | 7101.63                  | 1.67                    | 1.67                     |
| 2            | 885.22                             | 20.40                              | 0.0                                 | 1727.39                             | 0.75                               | 0.75                                | 6373.60                 | 146.90                  | 0.0                      | 12437.18                 | 5.40                    | 5.40                     |
| 3            | 996.18                             | 18.24                              | 0.0                                 | 1716.12                             | 3.31                               | 3.31                                | 12636.09                | 257.14                  | 0.0                      | 24197.23                 | 46.70                   | 46.70                    |
| 4            | 887.29                             | 15.60                              | 0.0                                 | 1737.30                             | 2.94                               | 2.94                                | 12510.77                | 220.03                  | 0.0                      | 24495.94                 | 41.42                   | 41.42                    |
| 5            | 872.10                             | 15.39                              | 0.0                                 | 1761.76                             | 3.09                               | 3.09                                | 12296.57                | 216.98                  | 0.0                      | 24840.85                 | 43.60                   | 43.60                    |
| 6            | 1076.76                            | 14.77                              | 0.0                                 | 1441.90                             | 4.76                               | 4.76                                | 48238.84                | 661.49                  | 0.0                      | 64597.17                 | 213.39                  | 213.39                   |
| 7            | 1076.76                            | 14.77                              | 0.0                                 | 1441.90                             | 4.76                               | 4.76                                | 48238.84                | 661.49                  | 0.0                      | 64597.17                 | 213.39                  | 213.39                   |
| 8            | 951.25                             | 12.95                              | 0.0                                 | 1644.09                             | 3.97                               | 3.97                                | 36432.81                | 496.01                  | 0.0                      | 62968.55                 | 152.17                  | 152.17                   |
| 8            | 1285.34                            | 18.10                              | 0.0                                 | 1105.04                             | 1.18                               | 1.18                                | 46786.24                | 658.77                  | 0.0                      | 40223.40                 | 42.77                   | 42.77                    |
| 9            | 1114.44                            | 17.28                              | 0.0                                 | 1375.81                             | 1.63                               | 1.63                                | 23514.60                | 364.58                  | 0.0                      | 29029.55                 | 34.49                   | 34.49                    |
| 10           | 857.60                             | 16.26                              | 0.0                                 | 1782.16                             | 2.20                               | 2.20                                | 4802.57                 | 91.03                   | 0.0                      | 9980.08                  | 12.34                   | 12.34                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 885.22                 | 6373.60              | 1.275                  | 20.40                  | 146.90               | 0.029                  | 0.75                   | 5.40                 | 0.0011                 |
| 6                       | 0.30                    | 44.80                          | 0.22                 | 1076.76                | 48238.84             | 0.241                  | 14.77                  | 661.49               | 0.003                  | 4.76                   | 213.39               | 0.0011                 |
| 7                       | 5.00                    | 44.80                          | 3.72                 | 1076.76                | 48238.84             | 4.004                  | 14.77                  | 661.49               | 0.055                  | 4.76                   | 213.39               | 0.0177                 |
| 9                       | 6.00                    | 21.10                          | 2.11                 | 1114.44                | 23514.60             | 2.351                  | 17.28                  | 364.58               | 0.036                  | 1.63                   | 34.49                | 0.0034                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 857.60                 | 4802.57              | 0.322                  | 16.26                  | 91.03                | 0.006                  | 2.20                   | 12.34                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 7.868                |                        |                      | 8.193                  |                        |                      | 0.130                  |                        |                      | 0.0241                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.041                  |                        |                      | 0.017                  |                        |                      | 0.0031                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 185 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 199599-9-AB

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 809. HRS

FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 79.90

ATMOSPHERIC PRESSURE: START 30.03 FINISH 30.03

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 56.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 58.00                         | 0.06090           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 91.00                         | 0.06254           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 168.00                        | 0.06360           |
| RUN UP-LEAN |                 | 4            | -0.0          | 13.20                          | 166.00                        | 0.06286           |
| RUN UP-RICH |                 | 5            | -0.0          | 13.20                          | 171.00                        | 0.06156           |
| TAKE-OFF    |                 | 6            | -0.0          | 31.80                          | 470.00                        | 0.05663           |
| CLIMB       |                 | 7            | -0.0          | 31.80                          | 470.00                        | 0.05663           |
| DESCENT     |                 | 8            | -0.0          | 26.40                          | 370.00                        | 0.05802           |
| DESCENT     | ON              | 8            | -0.0          | 37.40                          | 385.00                        | 0.07664           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 210.00                        | 0.06544           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 79.00                         | 0.06616           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 247.00                              | -0.00                              | 4.80                     | 7.90                          | 4575.00              | 22.00               | -0.07                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 2            | 381.00                              | -0.00                              | 4.90                     | 8.40                          | 2422.00              | 71.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 673.00                              | -0.00                              | 5.00                     | 8.60                          | 1830.00              | 290.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 639.00                              | -0.00                              | 5.10                     | 8.30                          | 2045.00              | 120.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 684.00                              | -0.00                              | 4.40                     | 8.80                          | 1561.00              | 305.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1300.00                             | -0.00                              | 1.10                     | 11.30                         | 382.00               | 1520.00             | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1300.00                             | -0.00                              | 1.10                     | 11.30                         | 382.00               | 1520.00             | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | 1110.00                             | -0.00                              | 2.50                     | 10.10                         | 694.00               | 913.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 8            | 986.00                              | -0.00                              | 10.30                    | 5.80                          | 2697.00              | 82.00               | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |
| 9            | 863.00                              | -0.00                              | 4.40                     | 7.50                          | 2045.00              | 111.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 460.00                              | -0.00                              | 5.80                     | 8.30                          | 2153.00              | 123.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 717.00                             | 40.23                              | 0.0                                 | 1905.87                             | 0.55                               | 0.55                                | 3453.92                 | 189.09                  | 0.0                      | 8957.60                  | 2.61                    | 2.61                     |
| 2            | 730.99                             | 20.69                              | 0.0                                 | 1968.93                             | 1.74                               | 1.74                                | 5263.09                 | 148.99                  | 0.0                      | 14176.29                 | 12.53                   | 12.53                    |
| 3            | 732.87                             | 15.36                              | 0.0                                 | 1980.59                             | 4.98                               | 6.98                                | 9673.90                 | 202.78                  | 0.0                      | 26143.80                 | 92.16                   | 92.16                    |
| 4            | 757.34                             | 17.39                              | 0.0                                 | 1936.58                             | 2.93                               | 2.93                                | 9996.85                 | 229.58                  | 0.0                      | 25562.85                 | 38.64                   | 38.64                    |
| 5            | 665.54                             | 13.52                              | 0.0                                 | 2091.43                             | 7.58                               | 7.58                                | 8785.14                 | 178.50                  | 0.0                      | 27606.86                 | 100.03                  | 100.03                   |
| 6            | 178.66                             | 3.55                               | 0.0                                 | 2883.77                             | 40.55                              | 40.55                               | 5681.51                 | 113.00                  | 0.0                      | 91703.88                 | 1289.54                 | 1289.54                  |
| 7            | 178.66                             | 3.55                               | 0.0                                 | 2883.77                             | 40.55                              | 40.55                               | 5681.51                 | 113.00                  | 0.0                      | 91703.88                 | 1289.54                 | 1289.54                  |
| 8            | 198.64                             | 6.34                               | 0.0                                 | 2530.50                             | 23.91                              | 23.91                               | 10524.21                | 167.32                  | 0.0                      | 66805.06                 | 631.31                  | 631.31                   |
| 8            | 1271.16                            | 19.06                              | 0.0                                 | 1124.68                             | 1.66                               | 1.66                                | 47541.18                | 712.95                  | 0.0                      | 42062.86                 | 62.17                   | 62.17                    |
| 9            | 916.69                             | 16.78                              | 0.0                                 | 1687.89                             | 2.61                               | 2.61                                | 16133.79                | 295.25                  | 0.0                      | 29706.80                 | 45.96                   | 45.96                    |
| 10           | 818.52                             | 17.40                              | 0.0                                 | 1840.42                             | 2.85                               | 2.85                                | 5238.52                 | 111.37                  | 0.0                      | 11778.70                 | 19.25                   | 19.25                    |

#### LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 730.99                 | 5263.09              | 0.053                  | 20.69                  | 148.99               | 0.030                  | 1.74                   | 12.53                | 0.0025                 |
| 6                       | 0.30                    | 31.80                          | 0.16                 | 178.66                 | 5681.51              | 0.028                  | 3.55                   | 113.00               | 0.001                  | 40.55                  | 1289.54              | 0.0064                 |
| 7                       | 5.00                    | 31.80                          | 2.64                 | 178.66                 | 5681.51              | 0.472                  | 3.55                   | 113.00               | 0.009                  | 40.55                  | 1289.54              | 0.1070                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 916.69                 | 16133.79             | 1.613                  | 16.78                  | 295.25               | 0.030                  | 2.61                   | 45.96                | 0.0046                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 818.52                 | 5238.52              | 0.351                  | 17.40                  | 111.37               | 0.007                  | 2.85                   | 19.25                | 0.0012                 |
| TOTAL FOR CYCLE         |                         |                                | 6.427                |                        |                      | 3.517                  |                        |                      | 0.077                  |                        |                      | 0.1218                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.547                  |                        |                      | 0.012                  |                        |                      | 0.0190                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 186 ENGINE TYPE AND MODEL: D-200-A SERIAL NUMBER: 199599-9-AC  
 RATED HORSEPOWER: 100.  
 ENGINE TOTAL TIME: 809. HRS  
 FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 80.00  
 ATMOSPHERIC PRESSURE: START 30.03 FINISH 30.03  
 INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 53.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 55.00                         | 0.06640           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 88.00                         | 0.06632           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 164.00                        | 0.06925           |
| RUN UP-LEAN |                 | 4            | -0.0          | 13.20                          | 163.00                        | 0.06572           |
| RUN UP-RICH |                 | 5            | -0.0          | 13.20                          | 174.00                        | 0.06456           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 548.00                        | 0.08003           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 548.00                        | 0.08003           |
| DESCENT     |                 | 8            | -0.0          | 32.80                          | 382.00                        | 0.07313           |
| DESCENT     | ON              | 8            | -0.0          | 37.40                          | 381.00                        | 0.08217           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 239.00                        | 0.07478           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 76.00                         | 0.07255           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 280.00                              | -0.00                              | 6.00                   | 7.70                          | 6270.00              | 17.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 5.80                   | 8.20                          | 3428.00              | 76.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 3            | 751.00                              | -0.00                              | 6.00                   | 8.80                          | 2146.00              | 115.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 684.00                              | -0.00                              | 5.70                   | 8.10                          | 2202.00              | 92.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 785.00                              | -0.00                              | 4.20                   | 9.70                          | 1644.00              | 170.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1188.00                             | -0.00                              | 9.60                   | 7.40                          | 2202.00              | 124.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1188.00                             | -0.00                              | 9.60                   | 7.40                          | 2202.00              | 124.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1099.00                             | -0.00                              | 7.80                   | 7.80                          | 1756.00              | 122.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1031.00                             | -0.00                              | 11.30                  | 6.00                          | 2592.00              | 43.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 9            | 908.00                              | -0.00                              | 9.20                   | 6.60                          | 2369.00              | 58.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 10           | 504.00                              | -0.00                              | 7.20                   | 8.20                          | 2815.00              | 63.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CU<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 846.05                             | 50.64                              | 0.0                                 | 1705.99                             | 0.39                               | 0.39                                | 3976.45                 | 737.99                  | 0.0                      | 8018.13                  | 1.85                    | 1.85                     |
| 2            | 816.95                             | 27.65                              | 0.0                                 | 1814.76                             | 1.76                               | 1.76                                | 5882.04                 | 199.11                  | 0.0                      | 13066.29                 | 12.66                   | 12.66                    |
| 3            | 807.31                             | 16.54                              | 0.0                                 | 1860.41                             | 2.54                               | 2.54                                | 10656.46                | 218.29                  | 0.0                      | 24557.42                 | 33.55                   | 33.55                    |
| 4            | 809.79                             | 17.97                              | 0.0                                 | 1852.73                             | 2.15                               | 2.15                                | 10689.19                | 236.50                  | 0.0                      | 24456.04                 | 28.34                   | 28.34                    |
| 5            | 603.30                             | 13.52                              | 0.0                                 | 2189.23                             | 4.01                               | 4.01                                | 7963.50                 | 178.53                  | 0.0                      | 28897.77                 | 57.94                   | 52.94                    |
| 6            | 1126.25                            | 14.80                              | 0.0                                 | 1364.06                             | 2.39                               | 2.39                                | 55862.00                | 733.85                  | 0.0                      | 67657.38                 | 118.52                  | 118.52                   |
| 7            | 1126.25                            | 14.80                              | 0.0                                 | 1364.06                             | 2.39                               | 2.39                                | 55862.00                | 733.85                  | 0.0                      | 67657.38                 | 118.52                  | 118.52                   |
| 8            | 948.87                             | 12.88                              | 0.0                                 | 1569.45                             | 2.57                               | 2.57                                | 32763.03                | 422.43                  | 0.0                      | 51478.07                 | 84.17                   | 84.17                    |
| 8            | 1300.10                            | 17.08                              | 0.0                                 | 1084.64                             | 0.81                               | 0.81                                | 48623.59                | 638.78                  | 0.0                      | 40565.63                 | 30.39                   | 30.39                    |
| 9            | 1158.96                            | 17.09                              | 0.0                                 | 1306.36                             | 1.20                               | 1.20                                | 25497.16                | 376.02                  | 0.0                      | 28739.47                 | 26.40                   | 26.40                    |
| 10           | 927.57                             | 20.77                              | 0.0                                 | 1659.84                             | 1.33                               | 1.33                                | 5936.45                 | 132.93                  | 0.0                      | 10622.97                 | 8.53                    | 8.53                     |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 816.95                 | 5882.04              | 1.176                  | 27.65                  | 199.11               | 0.040                  | 1.76                   | 12.66                | 0.0025                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1126.25                | 55862.00             | 0.279                  | 14.80                  | 733.85               | 0.004                  | 2.39                   | 118.52               | 0.0006                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1126.25                | 55862.00             | 4.677                  | 14.80                  | 733.85               | 0.061                  | 2.39                   | 118.52               | 0.0098                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1158.96                | 25497.16             | 2.550                  | 17.09                  | 376.02               | 0.038                  | 1.20                   | 26.40                | 0.0026                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 927.57                 | 5936.45              | 0.398                  | 20.77                  | 132.93               | 0.009                  | 1.33                   | 8.53                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 8.434                |                        |                      | 9.040                  |                        |                      | 0.151                  |                        |                      | 0.0162                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.072                  |                        |                      | 0.018                  |                        |                      | 0.0019                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 187 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 199196-B-AA  
 RATED HORSEPOWER: 100.  
 ENGINE TOTAL TIME: 952. HRS  
 FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 86.50  
 ATMOSPHERIC PRESSURE: START 29.97 FINISH 29.97  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 50.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 47.00                         | 0.06494           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.10                           | 86.00                         | 0.06191           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 162.00                        | 0.05717           |
| RUN UP-LEAN |                 | 4            | -0.0          | 14.10                          | 175.00                        | 0.05531           |
| RUN UP-RICH |                 | 5            | -0.0          | 14.10                          | 174.00                        | 0.05712           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 526.00                        | 0.07049           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 526.00                        | 0.07049           |
| DESCENT     |                 | 8            | -0.0          | 33.70                          | 410.00                        | 0.05932           |
| DESCENT     | ON              | 8            | -0.0          | 40.10                          | 412.00                        | 0.07113           |
| APPROACH    |                 | 9            | -0.0          | 21.10                          | 234.00                        | 0.06330           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 70.00                         | 0.06551           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 325.00                              | -0.00                              | 7.20                     | 5.30                          | 13559.00             | 4.00                | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 7.50                     | 5.30                          | 4076.00              | 17.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 3            | 695.00                              | -0.00                              | 5.00                     | 7.10                          | 2080.00              | 153.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 661.00                              | -0.00                              | 4.60                     | 7.10                          | 2080.00              | 87.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 706.00                              | -0.00                              | 4.90                     | 7.20                          | 2024.00              | 130.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1087.00                             | -0.00                              | 4.00                     | 5.80                          | 2634.00              | 122.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1087.00                             | -0.00                              | 9.00                     | 5.80                          | 2634.00              | 122.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1031.00                             | -0.00                              | 5.40                     | 7.20                          | 1747.00              | 305.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1009.00                             | -0.00                              | 9.50                     | 5.30                          | 3632.00              | 137.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 852.00                              | -0.00                              | 1.40                     | 5.40                          | 2412.00              | 89.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 460.00                              | -0.00                              | 7.70                     | 6.00                          | 3169.00              | 42.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1049.78                            | 113.22                             | 0.0                                 | 1214.18                             | 0.10                               | 0.10                                | 4933.98                 | 532.15                  | 0.0                      | 5706.67                  | 0.45                    | 0.45                     |
| 2            | 1147.20                            | 35.71                              | 0.0                                 | 1271.77                             | 0.43                               | 0.43                                | 9292.32                 | 289.23                  | 0.0                      | 10317.56                 | 3.46                    | 3.46                     |
| 3            | 820.70                             | 19.55                              | 0.0                                 | 1831.10                             | 4.13                               | 4.13                                | 10833.23                | 258.11                  | 0.0                      | 24170.45                 | 54.45                   | 54.45                    |
| 4            | 780.41                             | 20.21                              | 0.0                                 | 1892.60                             | 2.42                               | 2.42                                | 11003.73                | 284.96                  | 0.0                      | 26685.68                 | 34.18                   | 34.18                    |
| 5            | 804.65                             | 19.04                              | 0.0                                 | 1857.73                             | 3.51                               | 3.51                                | 11345.54                | 268.40                  | 0.0                      | 26194.00                 | 49.44                   | 49.44                    |
| 6            | 1207.04                            | 20.23                              | 0.0                                 | 1222.21                             | 2.69                               | 2.69                                | 59869.13                | 1003.51                 | 0.0                      | 60621.50                 | 133.30                  | 133.30                   |
| 7            | 1207.04                            | 20.23                              | 0.0                                 | 1222.21                             | 2.69                               | 2.69                                | 59869.13                | 1003.51                 | 0.0                      | 60621.50                 | 133.30                  | 133.30                   |
| 8            | 853.97                             | 15.82                              | 0.0                                 | 1789.05                             | 7.92                               | 7.92                                | 28778.93                | 533.24                  | 0.0                      | 60290.89                 | 266.99                  | 266.99                   |
| 9            | 1265.71                            | 27.71                              | 0.0                                 | 1109.49                             | 3.00                               | 3.00                                | 50755.00                | 1111.34                 | 0.0                      | 44490.71                 | 120.23                  | 120.23                   |
| 10           | 1104.02                            | 20.61                              | 0.0                                 | 1383.04                             | 7.18                               | 2.18                                | 23294.77                | 434.86                  | 0.0                      | 29182.14                 | 46.02                   | 46.02                    |
| 10           | 1109.63                            | 26.32                              | 0.0                                 | 1358.56                             | 0.99                               | 0.99                                | 7101.64                 | 168.45                  | 0.0                      | 8694.75                  | 6.36                    | 6.36                     |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 1147.20                | 9292.32              | 1.858                  | 35.71                  | 289.23               | 0.058                  | 0.43                   | 1.46                 | 0.0097                 |
| 6                       | 0.70                    | 49.60                          | 0.25                 | 1207.04                | 59869.13             | 0.299                  | 20.23                  | 1003.51              | 0.005                  | 2.69                   | 133.30               | 0.0007                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1207.04                | 59869.13             | 4.969                  | 20.23                  | 1003.51              | 0.083                  | 2.69                   | 133.30               | 0.0111                 |
| 7                       | 6.00                    | 21.10                          | 7.11                 | 1104.02                | 23294.77             | 7.324                  | 20.61                  | 434.86               | 0.043                  | 2.14                   | 46.02                | 0.0046                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 1109.63                | 7101.64              | 0.476                  | 26.32                  | 168.45               | 0.011                  | 0.99                   | 6.36                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 8.574                |                        |                      | 9.937                  |                        |                      | 0.201                  |                        |                      | 0.0175                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.165                  |                        |                      | 0.024                  |                        |                      | 0.0020                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 188 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 199196-8-48

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 952. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 86.50 FINISH 88.00

ATMOSPHERIC PRESSURE: START 29.97 FINISH 29.97

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 48.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 2.20                           | 24.00                         | 0.06232           |
| IDLE/TAXI   |                 | 2            | -0.0          | 6.40                           | 73.00                         | 0.06259           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 171.00                        | 0.05551           |
| RUN UP-LEAN |                 | 4            | -0.0          | 13.20                          | 169.00                        | 0.05466           |
| RUN UP-RICH |                 | 5            | -0.0          | 12.40                          | 166.00                        | 0.05376           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 523.00                        | 0.07094           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 523.00                        | 0.07094           |
| DESCENT     |                 | 8            | -0.0          | 31.80                          | 390.00                        | 0.06010           |
| DESCENT     | ON              | 8            | -0.0          | 41.10                          | 411.00                        | 0.07332           |
| APPROACH    |                 | 9            | -0.0          | 21.10                          | 234.00                        | 0.06369           |
| TAXI        |                 | 10           | -0.0          | 4.70                           | 53.00                         | 0.06287           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 291.00                              | -0.00                              | 5.20                     | 6.20                          | 9553.00              | 24.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 6.70                     | 6.40                          | 3239.00              | 47.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 3            | 684.00                              | -0.00                              | 3.90                     | 7.90                          | 1976.00              | 430.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 650.00                              | -0.00                              | 4.10                     | 7.50                          | 1921.00              | 150.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 695.00                              | -0.00                              | 3.00                     | 8.50                          | 1537.00              | 380.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1087.00                             | -0.00                              | 9.20                     | 5.70                          | 2525.00              | 122.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1087.00                             | -0.00                              | 9.20                     | 5.70                          | 2525.00              | 122.00              | -0.00                    | -0.00                    | 22.00              | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 5.40                     | 7.40                          | 1537.00              | 327.00              | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 9.60                     | 5.30                          | 7302.00              | 229.00              | -0.00                    | -0.00                    | 26.00              | -0.00 | -0.00        |
| 9            | 863.00                              | -0.00                              | 7.40                     | 6.00                          | 2306.00              | 82.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 437.00                              | -0.00                              | 7.10                     | 6.10                          | 2635.00              | 43.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 937.86                             | 82.76                              | 0.0                                 | 1473.60                             | 0.60                               | 0.60                                | 2063.30                 | 182.08                  | 0.0                      | 3241.91                  | 1.31                    | 1.31                     |
| 2            | 1008.32                            | 27.92                              | 0.0                                 | 1513.36                             | 1.16                               | 1.16                                | 6453.24                 | 178.67                  | 0.0                      | 9685.48                  | 7.44                    | 7.44                     |
| 3            | 656.71                             | 19.06                              | 0.0                                 | 2090.13                             | 11.89                              | 11.89                               | 8668.54                 | 251.54                  | 0.0                      | 27589.68                 | 156.99                  | 156.99                   |
| 4            | 702.42                             | 18.85                              | 0.0                                 | 2018.88                             | 4.22                               | 4.22                                | 9271.89                 | 248.80                  | 0.0                      | 26649.18                 | 55.72                   | 55.72                    |
| 5            | 520.07                             | 15.26                              | 0.0                                 | 2315.24                             | 10.82                              | 10.82                               | 6448.82                 | 189.23                  | 0.0                      | 28708.92                 | 134.17                  | 134.17                   |
| 6            | 1226.61                            | 19.28                              | 0.0                                 | 1194.07                             | 2.67                               | 2.67                                | 60839.69                | 956.33                  | 0.0                      | 59225.48                 | 132.52                  | 132.52                   |
| 7            | 1226.61                            | 19.28                              | 0.0                                 | 1194.07                             | 2.67                               | 2.67                                | 60839.69                | 956.33                  | 0.0                      | 59225.48                 | 132.52                  | 132.52                   |
| 8            | 842.17                             | 13.73                              | 0.0                                 | 1813.33                             | 8.38                               | 8.38                                | 26781.11                | 436.57                  | 0.0                      | 57663.98                 | 266.38                  | 266.38                   |
| 8            | 1240.82                            | 54.05                              | 0.0                                 | 1076.34                             | 4.86                               | 4.86                                | 50997.65                | 2221.60                 | 0.0                      | 44237.76                 | 199.82                  | 199.82                   |
| 9            | 1046.78                            | 19.57                              | 0.0                                 | 1397.26                             | 2.00                               | 2.00                                | 23142.00                | 413.02                  | 0.0                      | 29482.11                 | 42.12                   | 42.12                    |
| 10           | 1065.37                            | 22.64                              | 0.0                                 | 1438.18                             | 1.06                               | 1.06                                | 5007.25                 | 106.43                  | 0.0                      | 6759.42                  | 4.98                    | 4.98                     |

## LTU CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 6.40                           | 1.28                 | 1008.32                | 6453.24              | 1.291                  | 27.92                  | 179.67               | 0.036                  | 1.16                   | 7.44                 | 0.0015                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1226.61                | 60839.69             | 0.304                  | 19.28                  | 956.33               | 0.005                  | 2.67                   | 132.52               | 0.0007                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1226.61                | 60839.69             | 5.050                  | 19.28                  | 956.33               | 0.079                  | 2.67                   | 132.52               | 0.0110                 |
| 9                       | 6.00                    | 21.10                          | 2.11                 | 1096.78                | 23142.00             | 2.314                  | 17.57                  | 413.02               | 0.041                  | 2.00                   | 42.12                | 0.0042                 |
| 10                      | 4.00                    | 4.70                           | 0.31                 | 1065.37                | 5007.25              | 0.335                  | 22.64                  | 106.43               | 0.007                  | 1.06                   | 4.98                 | 0.0003                 |
| TOTAL FOR CYCLE         |                         |                                | 8.070                |                        |                      | 9.294                  |                        |                      | 0.168                  |                        |                      | 0.0177                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.152                  |                        |                      | 0.021                  |                        |                      | 0.0022                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 189 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 199196-8-AC  
 RATED HORSEPOWER: 100.  
 ENGINE TOTAL TIME: 953. HRS  
 FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 88.50 FINISH 88.50  
 ATMOSPHERIC PRESSURE: START 29.96 FINISH 29.96  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 46.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| 10LF-L0W    |                 | 1            | -0.0          | 3.00                           | 36.00                         | 0.06601           |
| 10LE/TAXI   |                 | 2            | -0.0          | 5.60                           | 66.00                         | 0.07127           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 173.00                        | 0.06933           |
| RUN UP-LEAN |                 | 4            | -0.0          | 12.40                          | 158.00                        | 0.06776           |
| RUN UP-RICH |                 | 5            | -0.0          | 12.40                          | 167.00                        | 0.06629           |
| TAKE-OFF    |                 | 6            | -0.0          | 48.60                          | 542.00                        | 0.08012           |
| CLIMB       |                 | 7            | -0.0          | 48.60                          | 542.00                        | 0.08012           |
| DESCENT     |                 | 8            | -0.0          | 31.80                          | 383.00                        | 0.07798           |
| DESCENT     | ON              | 8            | -0.0          | 39.20                          | 387.00                        | 0.08640           |
| APPROACH    |                 | 9            | -0.0          | 19.30                          | 214.00                        | 0.07764           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 63.00                         | 0.07528           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 280.00                              | -0.00                              | 5.60                     | 7.90                          | 7576.00              | 31.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 2            | 392.00                              | -0.00                              | 6.90                     | 8.20                          | 3074.00              | 63.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 740.00                              | -0.00                              | 4.60                     | 10.30                         | 2416.00              | 392.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 717.00                              | -0.00                              | 5.10                     | 9.40                          | 2361.00              | 134.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 740.00                              | -0.00                              | 3.60                     | 10.70                         | 2086.00              | 560.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1199.00                             | -0.00                              | 9.40                     | 7.60                          | 2580.00              | 210.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1199.00                             | -0.00                              | 9.40                     | 7.60                          | 2580.00              | 210.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1121.00                             | -0.00                              | 7.00                     | 8.60                          | 2031.00              | 244.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 1043.00                             | -0.00                              | 12.20                    | 5.80                          | 4392.00              | 71.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 909.00                              | -0.00                              | 4.10                     | 7.30                          | 3019.00              | 91.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 482.00                              | -0.00                              | 8.20                     | 7.70                          | 3294.00              | 60.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 793.49                             | 61.48                              | 0.0                                 | 1798.82                             | 0.72                               | 0.72                                | 2380.48                 | 184.44                  | 0.0                      | 5276.45                  | 2.16                    | 2.16                     |
| 2            | 904.74                             | 23.08                              | 0.0                                 | 1689.37                             | 1.36                               | 1.36                                | 5066.52                 | 129.27                  | 0.0                      | 9460.46                  | 7.60                    | 7.60                     |
| 3            | 613.75                             | 18.46                              | 0.0                                 | 2159.26                             | 8.59                               | 8.59                                | 8101.43                 | 243.69                  | 0.0                      | 28502.26                 | 113.40                  | 113.40                   |
| 4            | 699.18                             | 18.54                              | 0.0                                 | 2024.82                             | 3.02                               | 3.02                                | 8669.84                 | 229.87                  | 0.0                      | 25107.70                 | 37.42                   | 37.42                    |
| 5            | 501.29                             | 16.64                              | 0.0                                 | 2340.98                             | 17.81                              | 12.81                               | 6215.84                 | 206.28                  | 0.0                      | 29028.20                 | 158.82                  | 158.82                   |
| 6            | 1100.37                            | 17.30                              | 0.0                                 | 1397.86                             | 4.04                               | 4.04                                | 53478.04                | 840.64                  | 0.0                      | 67935.88                 | 196.24                  | 196.24                   |
| 7            | 1100.37                            | 17.30                              | 0.0                                 | 1397.86                             | 4.04                               | 4.04                                | 53478.04                | 840.64                  | 0.0                      | 67935.88                 | 196.24                  | 196.24                   |
| 8            | 894.87                             | 14.87                              | 0.0                                 | 1727.41                             | 5.12                               | 5.12                                | 28456.70                | 472.87                  | 0.0                      | 54931.71                 | 162.93                  | 162.93                   |
| 8            | 1336.66                            | 27.56                              | 0.0                                 | 998.45                              | 1.28                               | 1.28                                | 52396.86                | 1080.32                 | 0.0                      | 39139.22                 | 50.09                   | 50.09                    |
| 9            | 1100.72                            | 20.91                              | 0.0                                 | 1387.39                             | 1.81                               | 1.81                                | 21243.91                | 403.65                  | 0.0                      | 25776.50                 | 34.89                   | 34.89                    |
| 10           | 1020.74                            | 23.48                              | 0.0                                 | 1506.01                             | 1.23                               | 1.23                                | 5716.12                 | 131.51                  | 0.0                      | 8433.66                  | 6.87                    | 6.87                     |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 5.60                           | 1.12                 | 904.74                 | 5066.52              | 1.013                  | 23.68                  | 129.27               | 0.026                  | 1.36                   | 7.60                 | 0.0015                 |
| 6                       | 0.30                    | 48.60                          | 0.24                 | 1100.37                | 53478.04             | 0.267                  | 17.30                  | 840.64               | 0.004                  | 4.04                   | 196.24               | 0.0010                 |
| 7                       | 5.00                    | 48.60                          | 4.03                 | 1100.37                | 53478.04             | 4.439                  | 17.30                  | 840.64               | 0.070                  | 4.04                   | 196.24               | 0.0163                 |
| 9                       | 6.00                    | 19.30                          | 1.93                 | 1100.72                | 21243.91             | 2.124                  | 20.91                  | 403.65               | 0.040                  | 1.81                   | 34.89                | 0.0035                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 1020.74                | 5716.12              | 0.383                  | 23.48                  | 131.51               | 0.009                  | 1.23                   | 6.87                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 7.702                |                        |                      | 8.227                  |                        |                      | 0.149                  |                        |                      | 0.0227                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.068                  |                        |                      | 0.019                  |                        |                      | 0.0030                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 190 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 204579A

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 714. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 90.50 FINISH 87.50

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.85

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 2.20                           | 24.00                         | 0.07640           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.20                           | 82.00                         | 0.07448           |
| RUN UP      |                 | 3            | -0.0          | 19.30                          | 232.00                        | 0.07649           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.80                          | 190.00                        | 0.06916           |
| RUN UP-RICH |                 | 5            | -0.0          | 16.70                          | 201.00                        | 0.07080           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 519.00                        | 0.08349           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 519.00                        | 0.08349           |
| DESCENT     |                 | 8            | -0.0          | 34.60                          | 418.00                        | 0.07151           |
| OFFSCENT    | UN              | 8            | -0.0          | 39.20                          | 416.00                        | 0.08115           |
| APPROACH    |                 | 9            | -0.0          | 21.10                          | 233.00                        | 0.07619           |
| TAXI        |                 | 10           | -0.0          | 7.20                           | 84.00                         | 0.07687           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 325.00                              | -0.00                              | 8.20                     | 7.50                          | 7570.00              | 22.00               | -0.00                    | -0.00                    | 25.00              | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 8.30                     | 7.40                          | 3355.00              | 49.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 3            | 673.00                              | -0.00                              | 6.70                     | 8.30                          | 2468.00              | 190.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 650.00                              | -0.00                              | 6.50                     | 8.20                          | 2523.00              | 115.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 695.00                              | -0.00                              | 6.80                     | 8.30                          | 2135.00              | 125.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1076.00                             | -0.00                              | 11.00                    | 6.60                          | 2911.00              | 94.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1076.00                             | -0.00                              | 11.00                    | 6.60                          | 2911.00              | 94.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1054.00                             | -0.00                              | 6.80                     | 8.50                          | 1802.00              | 311.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 1031.00                             | -0.00                              | 10.40                    | 6.70                          | 3022.00              | 173.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 8            | 841.00                              | -0.00                              | 9.10                     | 7.00                          | 2690.00              | 125.00              | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 10           | 437.00                              | -0.00                              | 8.20                     | 8.10                          | 3022.00              | 75.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1006.62                            | 53.22                              | 0.0                                 | 1446.61                             | 0.44                               | 0.44                                | 2214.56                 | 117.09                  | 0.0                      | 3182.54                  | 0.98                    | 0.98                     |
| 2            | 1045.68                            | 24.21                              | 0.0                                 | 1464.84                             | 1.01                               | 1.01                                | 7528.87                 | 174.30                  | 0.0                      | 10546.82                 | 7.30                    | 7.30                     |
| 3            | 887.77                             | 18.73                              | 0.0                                 | 1727.98                             | 4.14                               | 4.14                                | 17133.85                | 361.47                  | 0.0                      | 33350.04                 | 79.81                   | 79.81                    |
| 4            | 878.23                             | 19.52                              | 0.0                                 | 1740.79                             | 2.55                               | 2.55                                | 13876.00                | 308.47                  | 0.0                      | 27504.45                 | 40.32                   | 40.32                    |
| 5            | 897.09                             | 16.13                              | 0.0                                 | 1720.46                             | 2.71                               | 2.71                                | 14981.41                | 269.39                  | 0.0                      | 28731.60                 | 45.23                   | 45.23                    |
| 6            | 1242.10                            | 18.83                              | 0.0                                 | 1170.77                             | 1.74                               | 1.74                                | 61608.27                | 933.76                  | 0.0                      | 58080.29                 | 86.48                   | 86.48                    |
| 7            | 1242.10                            | 18.83                              | 0.0                                 | 1170.77                             | 1.74                               | 1.74                                | 61608.27                | 933.76                  | 0.0                      | 58080.29                 | 86.48                   | 86.48                    |
| 8            | 887.43                             | 13.47                              | 0.0                                 | 1742.94                             | 6.67                               | 6.67                                | 30705.08                | 466.02                  | 0.0                      | 60305.72                 | 230.67                  | 230.67                   |
| 8            | 1207.34                            | 20.09                              | 0.0                                 | 1222.11                             | 3.30                               | 3.30                                | 47327.88                | 787.63                  | 0.0                      | 47906.77                 | 129.32                  | 129.32                   |
| 9            | 1123.11                            | 19.01                              | 0.0                                 | 1357.43                             | 2.53                               | 2.53                                | 23697.54                | 401.20                  | 0.0                      | 28641.64                 | 53.47                   | 53.47                    |
| 10           | 997.82                             | 21.06                              | 0.0                                 | 1548.67                             | 1.50                               | 1.50                                | 7184.27                 | 151.64                  | 0.0                      | 11150.43                 | 10.79                   | 10.79                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.20                           | 1.44                 | 1045.68                | 7528.87              | 1.506                  | 24.21                  | 174.30               | 0.035                  | 1.01                   | 7.30                 | 0.0015                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1242.10                | 61608.27             | 0.308                  | 18.83                  | 933.76               | 0.005                  | 1.74                   | 86.48                | 0.0004                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1242.10                | 61608.27             | 5.113                  | 18.83                  | 933.76               | 0.078                  | 1.74                   | 86.48                | 0.0072                 |
| 9                       | 6.00                    | 21.10                          | 2.11                 | 1123.11                | 23697.54             | 2.370                  | 19.01                  | 401.20               | 0.040                  | 2.53                   | 53.47                | 0.0053                 |
| 10                      | 4.00                    | 7.20                           | 0.48                 | 997.82                 | 7184.27              | 0.481                  | 21.06                  | 151.64               | 0.010                  | 1.50                   | 10.79                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                | 8.397                |                        |                      | 9.778                  |                        |                      | 0.167                  |                        |                      | 0.0151                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.164                  |                        |                      | 0.020                  |                        |                      | 0.0018                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 191 ENGINE TYPE AND MODEL: D-200-A SERIAL NUMBER: 204579B

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 714. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.50

ATMOSPHERIC PRESSURE: START 29.86 FINISH 29.86

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.60                           | 63.00                         | 0.07338           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.10                           | 94.00                         | 0.07415           |
| RUN UP      |                 | 3            | -0.0          | 15.00                          | 188.00                        | 0.06834           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.00                          | 183.00                        | 0.06770           |
| RUN UP-RICH |                 | 5            | -0.0          | 14.10                          | 183.00                        | 0.06791           |
| TAKE-OFF    |                 | 6            | -0.0          | 49.60                          | 515.00                        | 0.08402           |
| CLIMB       |                 | 7            | -0.0          | 49.60                          | 515.00                        | 0.08402           |
| DESCENT     |                 | 8            | -0.0          | 34.60                          | 416.00                        | 0.07206           |
| DESCENT     | ON              | 8            | -0.0          | 41.10                          | 429.00                        | 0.08367           |
| APPROACH    |                 | 9            | -0.0          | 21.10                          | 231.00                        | 0.07726           |
| TAXI        |                 | 10           | -0.0          | 7.20                           | 83.00                         | 0.07647           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 301.00                              | -0.00                              | 7.40                     | 7.80                          | 6313.00              | 40.00               | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 2            | 437.00                              | -0.00                              | 7.60                     | 8.10                          | 3184.00              | 82.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 3            | 684.00                              | -0.00                              | 5.50                     | 9.10                          | 2416.00              | 270.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 650.00                              | -0.00                              | 6.00                     | 8.40                          | 2525.00              | 180.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 695.00                              | -0.00                              | 4.80                     | 9.80                          | 1976.00              | 280.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1076.00                             | -0.00                              | 11.20                    | 6.50                          | 2965.00              | 89.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1076.00                             | -0.00                              | 11.20                    | 6.50                          | 2965.00              | 89.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1054.00                             | -0.00                              | 6.90                     | 8.50                          | 1976.00              | 342.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1041.00                             | -0.00                              | 11.00                    | 6.60                          | 3294.00              | 199.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 9            | 830.00                              | -0.00                              | 9.30                     | 7.00                          | 2965.00              | 129.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 10           | 491.00                              | -0.00                              | 8.20                     | 8.00                          | 3074.00              | 83.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 944.32                             | 46.14                              | 0.0                                 | 1563.93                             | 0.84                               | 0.84                                | 5288.16                 | 258.38                  | 0.0                      | 8758.02                  | 4.70                    | 4.70                     |
| 2            | 958.51                             | 23.00                              | 0.0                                 | 1605.11                             | 1.70                               | 1.70                                | 7763.92                 | 186.29                  | 0.0                      | 13001.42                 | 13.76                   | 13.76                    |
| 3            | 748.66                             | 18.83                              | 0.0                                 | 1946.26                             | 6.04                               | 6.04                                | 11229.88                | 282.52                  | 0.0                      | 29193.89                 | 90.55                   | 90.55                    |
| 4            | 827.26                             | 19.94                              | 0.0                                 | 1819.73                             | 4.08                               | 4.08                                | 12400.88                | 299.08                  | 0.0                      | 27295.99                 | 61.15                   | 61.15                    |
| 5            | 655.32                             | 15.45                              | 0.0                                 | 2102.20                             | 6.28                               | 6.28                                | 9234.97                 | 217.85                  | 0.0                      | 29641.07                 | 88.53                   | 88.53                    |
| 6            | 1257.28                            | 19.06                              | 0.0                                 | 1146.48                             | 1.64                               | 1.64                                | 62361.04                | 945.51                  | 0.0                      | 56865.26                 | 81.40                   | 81.40                    |
| 7            | 1257.28                            | 19.06                              | 0.0                                 | 1146.48                             | 1.64                               | 1.64                                | 62361.04                | 945.51                  | 0.0                      | 56865.26                 | 81.40                   | 81.40                    |
| 8            | 893.70                             | 14.66                              | 0.0                                 | 1729.82                             | 7.28                               | 7.28                                | 30922.10                | 507.17                  | 0.0                      | 59851.82                 | 251.75                  | 251.75                   |
| 8            | 1239.45                            | 21.26                              | 0.0                                 | 1168.47                             | 3.68                               | 3.68                                | 50941.34                | 873.67                  | 0.0                      | 48024.20                 | 151.37                  | 151.37                   |
| 9            | 1132.06                            | 20.67                              | 0.0                                 | 1338.82                             | 2.58                               | 2.58                                | 23886.38                | 436.15                  | 0.0                      | 28249.05                 | 54.42                   | 54.42                    |
| 10           | 1003.55                            | 21.55                              | 0.0                                 | 1538.34                             | 1.67                               | 1.67                                | 7225.52                 | 155.13                  | 0.0                      | 11076.02                 | 12.01                   | 12.01                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 958.51                 | 7763.92              | 1.553                  | 23.00                  | 186.29               | 0.037                  | 1.70                   | 13.76                | 0.0028                 |
| 6                       | 0.30                    | 49.60                          | 0.25                 | 1257.28                | 62361.04             | 0.312                  | 19.06                  | 945.51               | 0.005                  | 1.64                   | 81.40                | 0.0004                 |
| 7                       | 5.00                    | 49.60                          | 4.12                 | 1257.28                | 62361.04             | 5.176                  | 19.06                  | 945.51               | 0.078                  | 1.64                   | 81.40                | 0.0068                 |
| 9                       | 6.00                    | 21.10                          | 2.11                 | 1132.06                | 23886.38             | 2.389                  | 20.67                  | 436.15               | 0.044                  | 2.58                   | 54.42                | 0.0054                 |
| 10                      | 4.00                    | 7.20                           | 0.48                 | 1003.55                | 7225.52              | 0.484                  | 21.55                  | 155.13               | 0.010                  | 1.67                   | 12.01                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 8.577                |                        |                      | 9.913                  |                        |                      | 0.174                  |                        |                      | 0.0162                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.156                  |                        |                      | 0.020                  |                        |                      | 0.0019                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 192 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 204579C

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: 715. HRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.50 FINISH 89.00

ATMOSPHERIC PRESSURE: START 29.86 FINISH 29.86

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.00                           | 35.00                         | 0.07255           |
| IDLE/TAXI   |                 | 2            | -0.0          | 6.40                           | 72.00                         | 0.07718           |
| RUN UP      |                 | 3            | -0.0          | 13.20                          | 165.00                        | 0.07700           |
| RUN UP-LEAN |                 | 4            | -0.0          | 13.20                          | 162.00                        | 0.07177           |
| RUN UP-RICH |                 | 5            | -0.0          | 13.20                          | 172.00                        | 0.06884           |
| TAKE-OFF    |                 | 6            | -0.0          | 48.60                          | 543.00                        | 0.08097           |
| CLIMB       |                 | 7            | -0.0          | 48.60                          | 543.00                        | 0.08097           |
| DESCENT     |                 | 8            | -0.0          | 34.60                          | 406.00                        | 0.07554           |
| DESCENT     | ON              | 8            | -0.0          | 41.10                          | 411.00                        | 0.08659           |
| APPROACH    |                 | 9            | -0.0          | 22.00                          | 236.00                        | 0.08111           |
| TAXI        |                 | 10           | -0.0          | 5.60                           | 60.00                         | 0.08172           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 314.00                              | -0.00                              | 6.70                     | 8.00                          | 9717.00              | 32.00               | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 8.40                     | 7.80                          | 4447.00              | 63.00               | -0.00                    | -0.00                    | 17.00              | -0.00 | -0.00        |
| 3            | 740.00                              | -0.00                              | 6.00                     | 9.40                          | 2525.00              | 370.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 673.00                              | -0.00                              | 6.30                     | 9.00                          | 2745.00              | 172.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 751.00                              | -0.00                              | 4.70                     | 10.10                         | 2196.00              | 340.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1188.00                             | -0.00                              | 9.50                     | 7.70                          | 2470.00              | 137.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1188.00                             | -0.00                              | 9.50                     | 7.70                          | 2470.00              | 137.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 7.80                     | 8.30                          | 2306.00              | 254.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1065.00                             | -0.00                              | 12.00                    | 6.10                          | 4063.00              | 99.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 942.00                              | -0.00                              | 10.10                    | 7.00                          | 3184.00              | 103.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 10           | 538.00                              | -0.00                              | 9.70                     | 7.40                          | 4831.00              | 54.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 863.70                             | 71.74                              | 0.0                                 | 1620.37                             | 0.68                               | 0.68                                | 2591.08                 | 715.22                  | 0.0                      | 4861.11                  | 2.03                    | 2.03                     |
| 2            | 1019.54                            | 30.91                              | 0.0                                 | 1487.51                             | 1.26                               | 1.26                                | 6525.07                 | 197.84                  | 0.0                      | 9520.04                  | 8.04                    | 8.04                     |
| 3            | 774.41                             | 18.66                              | 0.0                                 | 1906.27                             | 7.84                               | 7.84                                | 10222.17                | 246.38                  | 0.0                      | 25162.73                 | 103.54                  | 103.54                   |
| 4            | 817.20                             | 20.39                              | 0.0                                 | 1834.29                             | 3.66                               | 3.66                                | 10787.04                | 269.18                  | 0.0                      | 24212.64                 | 48.37                   | 48.37                    |
| 5            | 632.18                             | 16.92                              | 0.0                                 | 2134.53                             | 7.51                               | 7.51                                | 8344.78                 | 223.30                  | 0.0                      | 28175.82                 | 99.16                   | 99.16                    |
| 6            | 1100.03                            | 16.38                              | 0.0                                 | 1400.91                             | 2.61                               | 2.61                                | 53461.47                | 796.08                  | 0.0                      | 68084.13                 | 126.64                  | 126.64                   |
| 7            | 1100.03                            | 16.39                              | 0.0                                 | 1400.91                             | 2.61                               | 2.61                                | 53461.47                | 796.08                  | 0.0                      | 68084.13                 | 126.64                  | 126.64                   |
| 8            | 964.93                             | 16.34                              | 0.0                                 | 1613.30                             | 5.16                               | 5.16                                | 33386.44                | 565.30                  | 0.0                      | 55820.25                 | 178.58                  | 178.58                   |
| 8            | 1309.98                            | 25.40                              | 0.0                                 | 1046.24                             | 1.78                               | 1.78                                | 53840.00                | 1044.04                 | 0.0                      | 43002.33                 | 72.96                   | 72.96                    |
| 9            | 1171.43                            | 21.15                              | 0.0                                 | 1275.64                             | 1.96                               | 1.96                                | 25771.38                | 465.30                  | 0.0                      | 28064.18                 | 43.17                   | 43.17                    |
| 10           | 1114.50                            | 71.79                              | 0.0                                 | 1335.91                             | 1.02                               | 1.02                                | 6241.17                 | 178.02                  | 0.0                      | 7491.07                  | 5.71                    | 5.71                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 6.40                           | 1.28                 | 1019.54                | 6525.07              | 1.305                  | 30.91                  | 197.84               | 0.040                  | 1.26                   | 8.04                 | 0.0016                 |
| 6                       | 0.30                    | 48.60                          | 0.24                 | 1100.03                | 53461.47             | 0.267                  | 16.38                  | 796.08               | 0.004                  | 2.61                   | 126.64               | 0.0006                 |
| 7                       | 5.00                    | 48.60                          | 0.03                 | 1100.03                | 53461.47             | 4.437                  | 16.38                  | 796.08               | 0.066                  | 2.61                   | 126.64               | 0.0105                 |
| 9                       | 6.00                    | 22.00                          | 2.20                 | 1171.43                | 25771.38             | 2.577                  | 21.15                  | 465.30               | 0.047                  | 1.96                   | 43.17                | 0.0043                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 1114.50                | 6241.17              | 0.418                  | 31.79                  | 178.02               | 0.012                  | 1.02                   | 5.71                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 8.132                |                        |                      | 9.005                  |                        |                      | 0.168                  |                        |                      | 0.0175                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.107                  |                        |                      | 0.021                  |                        |                      | 0.0021                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 229 ENGINE TYPE AND MODEL: D-320-A28 SERIAL NUMBER: 26664 A

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 257. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.50 FINISH 86.50

ATMOSPHERIC PRESSURE: START 30.32 FINISH 30.32

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 9

COMMENTS:

|           | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-----------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW  |                 | 1            | -0.0          | 6.40                           | 78.00                         | 0.07642           |
| IDLE/TAXI |                 | 2            | -0.0          | 8.10                           | 102.00                        | 0.07425           |
| RUN UP    |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.08137           |
| TAKE-OFF  |                 | 6            | -0.0          | 70.30                          | 734.00                        | 0.08856           |
| CLIMB     |                 | 7            | -0.0          | 70.30                          | 734.00                        | 0.08856           |
| DESCENT   |                 | 8            | -0.0          | 39.20                          | 459.00                        | 0.08004           |
| DESCENT   | ON              | 8            | -0.0          | 41.10                          | 401.00                        | 0.09196           |
| APPROACH  |                 | 9            | -0.0          | 19.30                          | 220.00                        | 0.07832           |
| TAXI      |                 | 10           | -0.0          | 16.70                          | 215.00                        | 0.07296           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 673.00                              | -0.00                              | 6.70                     | 9.40                          | 5100.00              | 24.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 2            | 706.00                              | -0.00                              | 5.90                     | 10.00                         | 2852.00              | 42.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 3            | 998.00                              | -0.00                              | 9.60                     | 7.60                          | 3256.00              | 36.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1412.00                             | -0.00                              | 11.60                    | 6.90                          | 4984.00              | 73.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1412.00                             | -0.00                              | 11.60                    | 6.90                          | 4984.00              | 73.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 8            | 1323.00                             | -0.00                              | 8.30                     | 8.80                          | 2391.00              | 101.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 11.20                    | 5.80                          | 6195.00              | 20.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1031.00                             | -0.00                              | 8.70                     | 7.90                          | 2968.00              | 66.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 10           | 807.00                              | -0.00                              | 5.20                     | 10.50                         | 2449.00              | 55.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 814.91                             | 35.53                              | 0.0                                 | 1796.38                             | 0.48                               | 0.48                                | 5215.39                 | 227.37                  | 0.0                      | 11496.93                 | 3.07                    | 3.07                     |
| 2            | 736.44                             | 20.39                              | 0.0                                 | 1961.20                             | 0.86                               | 0.86                                | 5965.14                 | 165.14                  | 0.0                      | 15885.73                 | 6.97                    | 6.97                     |
| 3            | 1106.62                            | 21.50                              | 0.0                                 | 1376.51                             | 0.68                               | 0.68                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 6            | 1233.51                            | 30.35                              | 0.0                                 | 1152.85                             | 1.28                               | 1.28                                | 86715.75                | 2133.85                 | 0.0                      | 81045.19                 | 89.64                   | 89.64                    |
| 7            | 1233.51                            | 30.35                              | 0.0                                 | 1152.85                             | 1.28                               | 1.28                                | 86715.75                | 2133.85                 | 0.0                      | 81045.19                 | 89.64                   | 89.64                    |
| 8            | 967.06                             | 15.96                              | 0.0                                 | 1611.00                             | 1.93                               | 1.93                                | 37908.73                | 625.44                  | 0.0                      | 63151.27                 | 75.77                   | 75.77                    |
| 8            | 1359.22                            | 36.53                              | 0.0                                 | 938.38                              | 0.34                               | 0.34                                | 55863.74                | 1501.56                 | 0.0                      | 38567.58                 | 13.90                   | 13.90                    |
| 9            | 1040.20                            | 20.32                              | 0.0                                 | 1484.10                             | 1.30                               | 1.30                                | 20075.84                | 392.25                  | 0.0                      | 28643.07                 | 25.02                   | 25.02                    |
| 10           | 658.85                             | 17.77                              | 0.0                                 | 2090.30                             | 1.14                               | 1.14                                | 11002.71                | 296.78                  | 0.0                      | 34907.91                 | 19.12                   | 19.12                    |

#### LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 736.44                 | 5965.14              | 1.193                  | 20.39                  | 165.14               | 0.033                  | 0.86                   | 6.97                 | 0.0014                 |
| 6                       | 0.30                    | 70.30                          | 0.35                 | 1233.51                | 86715.75             | 0.434                  | 30.35                  | 2133.85              | 0.011                  | 1.28                   | 89.64                | 0.0004                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1233.51                | 86715.75             | 7.197                  | 30.35                  | 2133.85              | 0.177                  | 1.28                   | 89.64                | 0.0074                 |
| 9                       | 6.00                    | 19.30                          | 1.93                 | 1040.20                | 20075.84             | 2.008                  | 20.32                  | 392.25               | 0.039                  | 1.30                   | 25.02                | 0.0025                 |
| 10                      | 4.00                    | 16.70                          | 1.12                 | 658.85                 | 11002.71             | 0.737                  | 17.77                  | 296.78               | 0.020                  | 1.14                   | 19.12                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 10.855               |                        |                      | 11.569                 |                        |                      | 0.280                  |                        |                      | 0.0131                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.066                  |                        |                      | 0.026                  |                        |                      | 0.0012                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 230 ENGINE TYPE AND MODEL: O-320-A2B SERIAL NUMBER: 26664 B

RATEO HORSEPOWER: 150.

ENGINE TOTAL TIME: 257. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.50 FINISH 84.00

ATMOSPHERIC PRESSURE: START 30.32 FINISH 30.32

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 9

COMMENTS:

|           | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-----------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW  |                 | 1            | -0.0          | 10.60                          | 141.00                        | 0.07113           |
| IDLE/TAXI |                 | 2            | -0.0          | 8.10                           | 106.00                        | 0.07244           |
| RUN UP    |                 | 3            | -0.0          | 30.90                          | 338.00                        | 0.08717           |
| TAKE-OFF  |                 | 6            | -0.0          | 69.30                          | 676.00                        | 0.09173           |
| CLIMB     |                 | 7            | -0.0          | 69.30                          | 676.00                        | 0.09173           |
| DESCENT   |                 | 8            | -0.0          | 40.10                          | 476.00                        | 0.07817           |
| DESCENT   | ON              | 8            | -0.0          | 41.10                          | 403.00                        | 0.09016           |
| APPROACH  |                 | 9            | -0.0          | 21.10                          | 238.00                        | 0.07899           |
| TAXI      |                 | 10           | -0.0          | 5.60                           | 73.00                         | 0.07100           |

| TFST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 617.00                              | -0.00                              | 4.20                     | 11.00                         | 3841.00              | 34.00               | -0.00                    | -0.00                    | 16.00              | -0.00 | -0.00        |
| 2            | 751.00                              | -0.00                              | 4.70                     | 10.90                         | 2619.00              | 57.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 3            | 953.00                              | -0.00                              | 10.60                    | 7.80                          | 3841.00              | 43.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1412.00                             | -0.00                              | 11.60                    | 6.70                          | 13619.00             | 42.00               | -0.00                    | -0.00                    | 34.00              | -0.00 | -0.00        |
| 7            | 1412.00                             | -0.00                              | 11.60                    | 6.70                          | 13619.00             | 42.00               | -0.00                    | -0.00                    | 34.00              | -0.00 | -0.00        |
| 8            | 1368.00                             | -0.00                              | 7.80                     | 8.90                          | 2444.00              | 104.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1222.00                             | -0.00                              | 12.90                    | 5.70                          | 6286.00              | 22.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1054.00                             | -0.00                              | 8.90                     | 7.80                          | 3317.00              | 65.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 785.00                              | -0.00                              | 4.30                     | 11.00                         | 2561.00              | 57.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 544.46                             | 28.52                              | 0.0                                 | 2240.53                             | 0.72                               | 0.72                                | 5771.32                 | 302.28                  | 0.0                      | 23749.62                 | 7.67                    | 7.67                     |
| 2            | 598.61                             | 19.10                              | 0.0                                 | 2191.28                             | 1.19                               | 1.19                                | 4842.75                 | 154.74                  | 0.0                      | 17668.36                 | 9.66                    | 9.66                     |
| 3            | 1140.03                            | 23.66                              | 0.0                                 | 1318.09                             | 0.76                               | 0.76                                | 35227.02                | 731.07                  | 0.0                      | 40728.91                 | 23.47                   | 23.47                    |
| 6            | 1191.89                            | 80.14                              | 0.0                                 | 1081.66                             | 0.71                               | 0.71                                | 82597.56                | 5553.92                 | 0.0                      | 74958.75                 | 49.12                   | 49.12                    |
| 7            | 1191.89                            | 80.14                              | 0.0                                 | 1081.66                             | 0.71                               | 0.71                                | 82597.56                | 5553.92                 | 0.0                      | 74958.75                 | 49.12                   | 49.12                    |
| 8            | 929.97                             | 16.69                              | 0.0                                 | 1667.26                             | 2.04                               | 2.04                                | 37291.90                | 669.22                  | 0.0                      | 66857.19                 | 81.67                   | 81.67                    |
| 8            | 1355.33                            | 37.82                              | 0.0                                 | 940.95                              | 0.38                               | 0.38                                | 55703.92                | 1554.59                 | 0.0                      | 38673.11                 | 15.60                   | 15.60                    |
| 9            | 1055.68                            | 22.53                              | 0.0                                 | 1453.71                             | 1.27                               | 1.27                                | 22274.91                | 475.46                  | 0.0                      | 30673.17                 | 26.72                   | 26.72                    |
| 10           | 558.43                             | 19.05                              | 0.0                                 | 2244.56                             | 1.22                               | 1.22                                | 3127.21                 | 106.67                  | 0.0                      | 12569.55                 | 6.81                    | 6.81                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 598.61                 | 4848.75              | 0.970                  | 19.10                  | 154.74               | 0.031                  | 1.19                   | 9.66                 | 0.0019                 |
| 6                       | 0.30                    | 69.30                          | 0.35                 | 1191.89                | 82597.56             | 0.413                  | 80.14                  | 5553.92              | 0.028                  | 0.71                   | 49.12                | 0.0002                 |
| 7                       | 5.00                    | 69.30                          | 5.75                 | 1191.89                | 82597.56             | 6.856                  | 80.14                  | 5553.92              | 0.461                  | 0.71                   | 49.12                | 0.0041                 |
| 9                       | 6.00                    | 21.10                          | 2.11                 | 1055.68                | 22274.91             | 2.227                  | 22.53                  | 475.46               | 0.048                  | 1.27                   | 26.72                | 0.0027                 |
| 10                      | 4.00                    | 5.60                           | 0.38                 | 558.43                 | 3127.21              | 0.210                  | 19.05                  | 106.67               | 0.007                  | 1.22                   | 6.81                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 10.204               |                        |                      | 10.675                 |                        |                      | 0.574                  |                        |                      | 0.0094                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.046                  |                        |                      | 0.056                  |                        |                      | 0.0009                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 231 ENGINE TYPE AND MODEL: O-320-A2B SERIAL NUMBER: 26664C

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 258. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.50 FINISH 84.00

ATMOSPHERIC PRESSURE: START 30.32 FINISH 30.28

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 41.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 9

COMMENTS:

|           | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-----------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LDW  |                 | 1            | -0.0          | 5.60                           | 75.00                         | 0.06745           |
| IDLE/TAXI |                 | 2            | -0.0          | 7.20                           | 97.00                         | 0.06951           |
| RUN UP    |                 | 3            | -0.0          | 30.90                          | 331.00                        | 0.08243           |
| TAKE-OFF  |                 | 6            | -0.0          | 69.30                          | 724.00                        | 0.08833           |
| CLIMB     |                 | 7            | -0.0          | 69.30                          | 724.00                        | 0.08833           |
| DESCENT   |                 | 8            | -0.0          | 41.10                          | 481.00                        | 0.07875           |
| DESCENT   | ON              | 8            | -0.0          | 40.10                          | 392.00                        | 0.09092           |
| APPROACH  |                 | 9            | -0.0          | 19.30                          | 221.00                        | 0.07930           |
| TAXI      |                 | 10           | -0.0          | 8.10                           | 106.00                        | 0.07152           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 583.00                              | -0.00                              | 3.10                     | 11.20                         | 4976.00              | 37.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 2            | 706.00                              | -0.00                              | 3.70                     | 11.30                         | 2532.00              | 57.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 1076.00                             | -0.00                              | 10.40                    | 6.90                          | 3928.00              | 51.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1390.00                             | -0.00                              | 11.40                    | 6.80                          | 7420.00              | 29.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 7            | 1390.00                             | -0.00                              | 11.40                    | 6.80                          | 7420.00              | 29.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 8            | 1345.00                             | -0.00                              | 8.10                     | 8.70                          | 2532.00              | 88.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 13.00                    | 5.70                          | 6897.00              | 20.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 9            | 1009.00                             | -0.00                              | 9.70                     | 8.10                          | 3230.00              | 70.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 785.00                              | -0.00                              | 4.60                     | 10.80                         | 2532.00              | 53.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/FUEL | MASS EMI<br>HC<br>LB/FUEL | MASS EMI<br>NO2<br>LB/FUEL | MASS EMI<br>CO2<br>LB/FUEL | MASS EMI<br>NO<br>LB/FUEL | MASS EMI<br>NOX<br>LB/FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 423.23                    | 38.91                     | 0.0                        | 2402.52                    | 0.83                      | 0.83                       | 2370.06                 | 217.88                  | 0.0                      | 13454.10                 | 4.65                    | 4.65                     |
| 2            | 490.05                    | 19.21                     | 0.0                        | 2351.57                    | 1.24                      | 1.24                       | 3528.38                 | 138.29                  | 0.0                      | 16931.27                 | 8.93                    | 8.93                     |
| 3            | 1187.51                   | 25.69                     | 0.0                        | 1237.92                    | 0.96                      | 0.96                       | 36694.17                | 793.74                  | 0.0                      | 38251.71                 | 29.56                   | 29.56                    |
| 6            | 1215.85                   | 45.32                     | 0.0                        | 1139.52                    | 0.51                      | 0.51                       | 84258.44                | 3140.93                 | 0.0                      | 78968.81                 | 35.21                   | 35.21                    |
| 7            | 1215.85                   | 45.32                     | 0.0                        | 1139.52                    | 0.51                      | 0.51                       | 84258.44                | 3140.93                 | 0.0                      | 78968.81                 | 35.21                   | 35.21                    |
| 8            | 959.58                    | 17.18                     | 0.0                        | 1619.40                    | 1.71                      | 1.71                       | 39438.70                | 706.07                  | 0.0                      | 66557.19                 | 70.38                   | 70.38                    |
| 8            | 1354.48                   | 41.16                     | 0.0                        | 931.13                     | 0.34                      | 0.34                       | 54314.82                | 1650.36                 | 0.0                      | 37418.64                 | 13.73                   | 13.73                    |
| 9            | 1026.46                   | 21.83                     | 0.0                        | 1501.57                    | 1.36                      | 1.36                       | 19810.62                | 421.24                  | 0.0                      | 28980.25                 | 26.18                   | 26.18                    |
| 10           | 593.69                    | 18.72                     | 0.0                        | 2190.08                    | 1.12                      | 1.12                       | 4808.85                 | 151.60                  | 0.0                      | 17739.67                 | 9.10                    | 9.10                     |

#### LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 7.20                           | 1.44                 | 490.05                 | 3528.38              | 0.706                  | 19.21                  | 138.29               | 0.028                  | 1.24                   | 8.93                 | 0.0018                 |
| 6                       | 0.30            | 69.30                          | 0.35                 | 1215.85                | 84258.44             | 0.421                  | 45.32                  | 3140.93              | 0.016                  | 0.51                   | 35.21                | 0.0002                 |
| 7                       | 5.00            | 69.30                          | 5.75                 | 1215.85                | 84258.44             | 6.993                  | 45.32                  | 3140.93              | 0.261                  | 0.51                   | 35.21                | 0.0029                 |
| 9                       | 6.00            | 19.30                          | 1.93                 | 1026.46                | 19810.62             | 1.981                  | 21.83                  | 421.24               | 0.042                  | 1.36                   | 26.18                | 0.0026                 |
| 10                      | 4.00            | 8.10                           | 0.54                 | 593.69                 | 4808.85              | 0.322                  | 18.72                  | 151.60               | 0.010                  | 1.12                   | 9.10                 | 0.0006                 |
| TOTAL FOR CYCLE         |                 |                                | 10.011               |                        |                      | 10.424                 |                        |                      | 0.356                  |                        |                      | 0.0081                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 1.041                  |                        |                      | 0.036                  |                        |                      | 0.0008                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 384 ENGINE TYPE AND MODEL: D-320-B3B

SERIAL NUMBER: L-4393-39

RATED HORSEPOWER: 160.

ENGINE TOTAL TIME: 563. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 176.00                        | 0.02233           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 247.00                        | 0.02358           |
| RUN UP      |                 | 3            | -0.0          | 32.80                          | 479.00                        | 0.03164           |
| RUN UP-LEAN |                 | 4            | -0.0          | 16.40                          | 246.00                        | 0.02402           |
| RUN UP-RICH |                 | 5            | -0.0          | 30.50                          | 431.00                        | 0.02706           |
| TAKE-OFF    |                 | 6            | -0.0          | 50.40                          | 541.00                        | 0.06197           |
| CLIMB       |                 | 7            | -0.0          | 45.70                          | 548.00                        | 0.06581           |
| DESCENT     |                 | 8            | -0.0          | 42.20                          | 502.00                        | 0.06492           |
| DESCENT     | ON              | 8            | -0.0          | 42.20                          | 432.00                        | 0.06675           |
| APPROACH    |                 | 9            | -0.0          | 36.30                          | 385.00                        | 0.05234           |
| TAXI        |                 | 10           | -0.0          | 17.60                          | 233.00                        | 0.02136           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 168.00                              | -0.00                              | 1.70                     | 2.60                          | 4168.00              | 0.0                 | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 2            | 191.00                              | -0.00                              | 1.70                     | 3.10                          | 1924.00              | 0.0                 | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 3            | 426.00                              | -0.00                              | 0.50                     | 6.20                          | 962.00               | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 426.00                              | -0.00                              | 0.10                     | 5.00                          | 321.00               | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 415.00                              | -0.00                              | 0.60                     | 5.00                          | 1817.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 830.00                              | -0.00                              | 7.60                     | 5.30                          | 3206.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 740.00                              | -0.00                              | 6.20                     | 7.70                          | 2992.00              | 0.0                 | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 695.00                              | -0.00                              | 6.20                     | 7.50                          | 2939.00              | 0.0                 | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 594.00                              | -0.00                              | 8.90                     | 4.90                          | 4061.00              | 0.0                 | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 516.00                              | -0.00                              | 6.50                     | 4.30                          | 3206.00              | 0.0                 | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 269.00                              | -0.00                              | 0.90                     | 3.40                          | 2298.00              | 0.0                 | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 728.12                             | 102.24                             | 0.0                                 | 1749.71                             | 0.0                                | 0.0                                 | 11067.43                | 1554.07                 | 0.0                      | 26595.58                 | 0.0                     | 0.0                      |
| 2            | 687.93                             | 44.59                              | 0.0                                 | 1971.03                             | 0.0                                | 0.0                                 | 13689.71                | 887.35                  | 0.0                      | 39223.42                 | 0.0                     | 0.0                      |
| 3            | 148.63                             | 16.38                              | 0.0                                 | 2895.78                             | 0.0                                | 0.0                                 | 4875.05                 | 537.19                  | 0.0                      | 94981.56                 | 0.0                     | 0.0                      |
| 4            | 39.36                              | 7.24                               | 0.0                                 | 3092.54                             | 0.0                                | 0.0                                 | 645.58                  | 118.69                  | 0.0                      | 50717.61                 | 0.0                     | 0.0                      |
| 5            | 209.65                             | 36.36                              | 0.0                                 | 2745.08                             | 0.0                                | 0.0                                 | 6394.36                 | 1109.04                 | 0.0                      | 83724.88                 | 0.0                     | 0.0                      |
| 6            | 1161.35                            | 28.06                              | 0.0                                 | 1272.52                             | 0.0                                | 0.0                                 | 58532.20                | 1414.13                 | 0.0                      | 64135.02                 | 0.0                     | 0.0                      |
| 7            | 882.12                             | 24.38                              | 0.0                                 | 1721.34                             | 0.0                                | 0.0                                 | 40313.06                | 1114.19                 | 0.0                      | 78665.25                 | 0.0                     | 0.0                      |
| 8            | 895.07                             | 24.30                              | 0.0                                 | 1701.23                             | 0.0                                | 0.0                                 | 37771.74                | 1025.46                 | 0.0                      | 71791.81                 | 0.0                     | 0.0                      |
| 8            | 1265.66                            | 33.08                              | 0.0                                 | 1094.87                             | 0.0                                | 0.0                                 | 53410.84                | 1395.78                 | 0.0                      | 46203.38                 | 0.0                     | 0.0                      |
| 9            | 1180.83                            | 33.36                              | 0.0                                 | 1227.38                             | 0.0                                | 0.0                                 | 42864.07                | 1210.84                 | 0.0                      | 44554.00                 | 0.0                     | 0.0                      |
| 10           | 401.39                             | 58.70                              | 0.0                                 | 2382.54                             | 0.0                                | 0.0                                 | 7064.44                 | 1033.07                 | 0.0                      | 41932.66                 | 0.0                     | 0.0                      |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.90                          | 3.98                 | 687.93                 | 13689.71             | 2.738                  | 44.59                  | 887.35               | 0.177                  | 0.0                    | 0.0                  | 0.0                    |
| 6                       | 0.30                    | 50.40                          | 0.25                 | 1161.35                | 59532.20             | 0.293                  | 28.06                  | 1414.13              | 0.007                  | 0.0                    | 0.0                  | 0.0                    |
| 7                       | 5.00                    | 45.70                          | 3.79                 | 882.12                 | 40313.06             | 3.346                  | 24.38                  | 1114.19              | 0.092                  | 0.0                    | 0.0                  | 0.0                    |
| 4                       | 6.00                    | 36.30                          | 3.63                 | 1180.83                | 42864.07             | 4.286                  | 33.36                  | 1210.84              | 0.121                  | 0.0                    | 0.0                  | 0.0                    |
| 10                      | 4.00                    | 17.60                          | 1.18                 | 401.39                 | 7064.44              | 0.473                  | 58.70                  | 1033.07              | 0.069                  | 0.0                    | 0.0                  | 0.0                    |
| TOTAL FOR CYCLE         |                         |                                | 12.834               |                        |                      | 11.136                 |                        |                      | 0.467                  |                        |                      | 0.0                    |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.868                  |                        |                      | 0.036                  |                        |                      | 0.0                    |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 385 ENGINE TYPE AND MODEL: O-320-B3B SERIAL NUMBER: L-4393-39A

RATED HORSEPOWER: 160.

ENGINE TOTAL TIME: 563. MRS

FUEL: AV GAS 100/130 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.50 FINISH 72.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 94.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 16.40                          | 197.00                        | 0.04672           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 261.00                        | 0.05921           |
| RUN UP      |                 | 3            | -0.0          | 32.80                          | 370.00                        | 0.07631           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.20                          | 172.00                        | 0.07351           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 356.00                        | 0.07325           |
| TAKE-OFF    |                 | 6            | -0.0          | 50.40                          | 544.00                        | 0.08588           |
| CLIMB       |                 | 7            | -0.0          | 45.70                          | 524.00                        | 0.08286           |
| DESCENT     |                 | 8            | -0.0          | 44.50                          | 535.00                        | 0.08018           |
| DESCENT     | ON              | 8            | -0.0          | 43.40                          | 444.00                        | 0.09169           |
| APPROACH    |                 | 9            | -0.0          | 36.30                          | 414.00                        | 0.08238           |
| TAXI        |                 | 10           | -0.0          | 18.80                          | 250.00                        | 0.02565           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 381.00                              | -0.00                              | 2.60                     | 6.40                          | 10368.00             | 0.0                 | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 2            | 549.00                              | -0.00                              | 3.50                     | 9.00                          | 3615.00              | 0.0                 | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 3            | 863.00                              | -0.00                              | 8.60                     | 7.50                          | 3350.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 942.00                              | -0.00                              | 8.20                     | 7.30                          | 3190.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 863.00                              | -0.00                              | 8.20                     | 7.20                          | 3562.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1177.00                             | -0.00                              | 10.70                    | 7.40                          | 3722.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1289.00                             | -0.00                              | 9.00                     | 8.60                          | 3296.00              | 0.0                 | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1300.00                             | -0.00                              | 7.60                     | 9.50                          | 3296.00              | 0.0                 | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1121.00                             | -0.00                              | 12.50                    | 6.70                          | 4466.00              | 0.0                 | -0.00                    | -0.00                    | 17.00              | -0.00 | -0.00        |
| 9            | 1087.00                             | -0.00                              | 9.10                     | 8.40                          | 3084.00              | 0.0                 | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 549.00                              | -0.00                              | 2.80                     | 2.30                          | 3084.00              | 0.0                 | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 523.34                             | 119.52                             | 0.0                                 | 2024.07                             | 0.0                                | 0.0                                 | 8582.69                 | 1960.16                 | 0.0                      | 33194.67                 | 0.0                     | 0.0                      |
| 2            | 549.77                             | 32.52                              | 0.0                                 | 2221.22                             | 0.0                                | 0.0                                 | 10940.34                | 647.17                  | 0.0                      | 44202.19                 | 0.0                     | 0.0                      |
| 3            | 1057.14                            | 23.58                              | 0.0                                 | 1448.54                             | 0.0                                | 0.0                                 | 34674.02                | 773.56                  | 0.0                      | 47512.19                 | 0.0                     | 0.0                      |
| 4            | 1047.22                            | 23.33                              | 0.0                                 | 1464.82                             | 0.0                                | 0.0                                 | 15917.69                | 354.65                  | 0.0                      | 22265.24                 | 0.0                     | 0.0                      |
| 5            | 1051.39                            | 26.16                              | 0.0                                 | 1450.51                             | 0.0                                | 0.0                                 | 33223.94                | 826.56                  | 0.0                      | 45836.15                 | 0.0                     | 0.0                      |
| 6            | 1170.22                            | 23.31                              | 0.0                                 | 1271.61                             | 0.0                                | 0.0                                 | 58978.99                | 1174.99                 | 0.0                      | 64089.00                 | 0.0                     | 0.0                      |
| 7            | 1014.08                            | 21.27                              | 0.0                                 | 1522.54                             | 0.0                                | 0.0                                 | 46343.61                | 972.03                  | 0.0                      | 69579.94                 | 0.0                     | 0.0                      |
| 8            | 880.90                             | 21.88                              | 0.0                                 | 1730.12                             | 0.0                                | 0.0                                 | 39200.18                | 973.66                  | 0.0                      | 76990.31                 | 0.0                     | 0.0                      |
| 8            | 1285.36                            | 26.30                              | 0.0                                 | 1082.50                             | 0.0                                | 0.0                                 | 55784.61                | 1141.48                 | 0.0                      | 46980.50                 | 0.0                     | 0.0                      |
| 9            | 1032.33                            | 20.04                              | 0.0                                 | 1497.25                             | 0.0                                | 0.0                                 | 37473.54                | 727.35                  | 0.0                      | 54350.17                 | 0.0                     | 0.0                      |
| 10           | 1045.90                            | 65.98                              | 0.0                                 | 1349.89                             | 0.0                                | 0.0                                 | 19662.95                | 1240.37                 | 0.0                      | 25377.96                 | 0.0                     | 0.0                      |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.90                          | 3.98                 | 549.77                 | 10940.34             | 2.188                  | 32.52                  | 647.17               | 0.129                  | 0.0                    | 0.0                  | 0.0                    |
| 4                       | 0.30                    | 50.40                          | 0.25                 | 1170.22                | 58978.99             | 0.295                  | 23.31                  | 1174.99              | 0.006                  | 0.0                    | 0.0                  | 0.0                    |
| 7                       | 5.00                    | 45.70                          | 3.79                 | 1014.08                | 46343.61             | 3.847                  | 21.27                  | 972.03               | 0.081                  | 0.0                    | 0.0                  | 0.0                    |
| 9                       | 6.00                    | 36.30                          | 1.63                 | 1032.33                | 37473.54             | 3.747                  | 20.04                  | 727.35               | 0.073                  | 0.0                    | 0.0                  | 0.0                    |
| 10                      | 4.00                    | 18.80                          | 1.26                 | 1045.90                | 19662.95             | 1.317                  | 65.98                  | 1240.37              | 0.083                  | 0.0                    | 0.0                  | 0.0                    |
| TOTAL FOR CYCLE:        |                         |                                | 12.915               |                        |                      | 11.394                 |                        |                      | 0.372                  |                        |                      | 0.0                    |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.882                  |                        |                      | 0.029                  |                        |                      | 0.0                    |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 386 ENGINE TYPE AND MODEL: O-320-B3B

SERIAL NUMBER: L-4393-39B

RATED HORSEPOWER: 160.

ENGINE TOTAL TIME: 563. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 66.00 FINISH 68.00

ATMOSPHERIC PRESSURE: START 29.97 FINISH 29.97

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 14.10                          | 149.00                        | 0.07271           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 222.00                        | 0.08455           |
| RUN UP      |                 | 3            | -0.0          | 38.70                          | 449.00                        | 0.07494           |
| RUN UP-LEAN |                 | 4            | -0.0          | 21.10                          | 247.00                        | 0.07390           |
| RUN UP-RICH |                 | 5            | -0.0          | 38.70                          | 453.00                        | 0.07297           |
| TAKE-OFF    |                 | 6            | -0.0          | 73.80                          | 905.00                        | 0.07411           |
| CLIMB       |                 | 7            | -0.0          | 59.80                          | 770.00                        | 0.07345           |
| DESCENT     |                 | 8            | -0.0          | 55.10                          | 697.00                        | 0.07496           |
| DESCENT     | ON              | 8            | -0.0          | 56.30                          | 580.00                        | 0.08864           |
| APPROACH    |                 | 9            | -0.0          | 43.40                          | 500.00                        | 0.08120           |
| TAXI        |                 | 10           | -0.0          | 19.90                          | 246.00                        | 0.07067           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 336.00                              | -0.00                              | 7.50                     | 6.90                          | 12244.00             | 18.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | 527.00                              | -0.00                              | 9.70                     | 8.00                          | 5424.00              | 48.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 3            | 807.00                              | -0.00                              | 7.90                     | 8.00                          | 2792.00              | 137.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 852.00                              | -0.00                              | 7.60                     | 8.10                          | 2631.00              | 101.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 807.00                              | -0.00                              | 7.50                     | 8.00                          | 2578.00              | 106.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 6.50                     | 9.30                          | 3007.00              | 411.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1300.00                             | -0.00                              | 5.20                     | 10.60                         | 2578.00              | 944.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 8            | 1278.00                             | -0.00                              | 5.80                     | 10.30                         | 2631.00              | 737.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | 1076.00                             | -0.00                              | 11.90                    | 6.70                          | 3974.00              | 175.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 8.80                     | 8.50                          | 2631.00              | 296.00              | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |
| 10           | 482.00                              | -0.00                              | 5.90                     | 9.10                          | 3437.00              | 100.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 969.75                             | 90.67                              | 0.0                                 | 1401.80                             | 0.38                               | 0.38                                | 13673.47                | 1278.46                 | 0.0                      | 19765.35                 | 5.39                    | 5.39                     |
| 2            | 1074.22                            | 34.40                              | 0.0                                 | 1392.03                             | 0.87                               | 0.87                                | 21376.88                | 684.60                  | 0.0                      | 27701.35                 | 17.38                   | 17.38                    |
| 3            | 986.44                             | 19.97                              | 0.0                                 | 1569.54                             | 2.81                               | 2.81                                | 38175.32                | 772.71                  | 0.0                      | 60741.27                 | 108.74                  | 108.74                   |
| 4            | 961.83                             | 19.07                              | 0.0                                 | 1610.67                             | 2.10                               | 2.10                                | 20294.60                | 402.38                  | 0.0                      | 33985.21                 | 44.30                   | 44.30                    |
| 5            | 961.54                             | 18.93                              | 0.0                                 | 1611.52                             | 2.23                               | 2.23                                | 37211.61                | 732.56                  | 0.0                      | 62365.63                 | 86.39                   | 86.39                    |
| 6            | 815.59                             | 21.61                              | 0.0                                 | 1833.49                             | 8.47                               | 8.47                                | 60190.32                | 1594.75                 | 0.0                      | 135311.44                | 625.14                  | 625.14                   |
| 7            | 654.21                             | 18.58                              | 0.0                                 | 2095.37                             | 19.51                              | 19.51                               | 39121.91                | 1110.82                 | 0.0                      | 125302.81                | 1166.57                 | 1166.57                  |
| 8            | 716.08                             | 18.60                              | 0.0                                 | 1998.08                             | 14.95                              | 14.95                               | 39456.23                | 1025.07                 | 0.0                      | 110093.88                | 823.52                  | 823.52                   |
| 8            | 1265.48                            | 24.20                              | 0.0                                 | 1119.49                             | 3.06                               | 3.06                                | 71246.38                | 1362.67                 | 0.0                      | 63027.39                 | 172.10                  | 172.10                   |
| 9            | 1012.24                            | 17.33                              | 0.0                                 | 1536.24                             | 5.59                               | 5.59                                | 43931.20                | 752.24                  | 0.0                      | 66672.56                 | 242.72                  | 242.72                   |
| 10           | 776.83                             | 25.92                              | 0.0                                 | 1882.57                             | 2.16                               | 2.16                                | 15458.83                | 515.76                  | 0.0                      | 37463.13                 | 43.04                   | 43.04                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MUDF<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.90                          | 3.98                 | 1074.22                | 21376.88             | 4.275                  | 34.40                  | 684.60               | 0.137                  | 0.87                   | 17.38                | 0.0035                 |
| 6                       | 0.30                    | 73.80                          | 0.37                 | 815.59                 | 60190.32             | 0.301                  | 21.61                  | 1594.75              | 0.008                  | 8.47                   | 625.14               | 0.0031                 |
| 7                       | 5.00                    | 59.80                          | 4.96                 | 654.21                 | 39121.91             | 3.247                  | 18.58                  | 1110.82              | 0.092                  | 19.51                  | 1166.57              | 0.0968                 |
| 9                       | 6.00                    | 43.40                          | 4.34                 | 1012.24                | 43931.20             | 4.393                  | 17.33                  | 752.24               | 0.075                  | 5.59                   | 242.72               | 0.0243                 |
| 10                      | 4.00                    | 19.90                          | 1.33                 | 776.83                 | 15458.83             | 1.036                  | 25.92                  | 515.76               | 0.035                  | 2.16                   | 43.04                | 0.0029                 |
| TOTAL FOR CYCLE         |                         |                                | 14.986               |                        |                      | 13.252                 |                        |                      | 0.347                  |                        |                      | 0.1306                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.884                  |                        |                      | 0.023                  |                        |                      | 0.0087                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 387 ENGINE TYPE AND MODEL: O-320-B38 SERIAL NUMBER: L-4336-39

RATED HORSEPOWER: 160.

ENGINE TOTAL TIME: 433. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 70.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 29.97 FINISH 29.97

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 44.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 10.50                          | 101.00                        | 0.08209           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.20                          | 164.00                        | 0.08546           |
| RUN UP      |                 | 3            | -0.0          | 21.10                          | 23.50                         | 0.07892           |
| RUN UP-LEAN |                 | 4            | -0.0          | 18.80                          | 210.00                        | 0.07834           |
| RUN UP-RICH |                 | 5            | -0.0          | 19.90                          | 223.00                        | 0.07854           |
| TAKE-OFF    |                 | 6            | -0.0          | 79.70                          | 958.00                        | 0.08184           |
| CLIMB       |                 | 7            | -0.0          | 68.00                          | 974.00                        | 0.06807           |
| DESCENT     |                 | 8            | -0.0          | 51.60                          | 658.00                        | 0.07579           |
| DESCENT     | ON              | 8            | -0.0          | 53.90                          | 566.00                        | 0.08793           |
| APPROACH    |                 | 9            | -0.0          | 35.20                          | 408.00                        | 0.08080           |
| TAXI        |                 | 10           | -0.0          | 16.40                          | 182.00                        | 0.07945           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 404.00                              | -0.00                              | 10.00                    | 5.90                          | 16435.00             | 79.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 2            | 493.00                              | -0.00                              | 10.50                    | 7.30                          | 5750.00              | 29.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 863.00                              | -0.00                              | 9.20                     | 7.50                          | 2929.00              | 89.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 908.00                              | -0.00                              | 9.00                     | 7.60                          | 2766.00              | 70.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 886.00                              | -0.00                              | 9.00                     | 7.60                          | 3200.00              | 69.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1267.00                             | -0.00                              | 7.40                     | 9.70                          | 7068.00              | 529.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1379.00                             | -0.00                              | 1.70                     | 13.10                         | 2658.00              | 2846.00             | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1267.00                             | -0.00                              | 5.70                     | 10.60                         | 2658.00              | 724.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 11.50                    | 7.00                          | 3743.00              | 141.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 1087.00                             | -0.00                              | 5.60                     | 8.60                          | 2875.00              | 208.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 482.00                              | -0.00                              | 9.20                     | 7.40                          | 4990.00              | 53.00               | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1151.56                            | 108.39                             | 0.0                                 | 1067.52                             | 1.49                               | 1.49                                | 12091.35                | 1138.12                 | 0.0                      | 11208.96                 | 15.69                   | 15.69                    |
| 2            | 1154.42                            | 36.21                              | 0.0                                 | 1261.06                             | 0.52                               | 0.52                                | 17547.18                | 550.34                  | 0.0                      | 19168.09                 | 7.96                    | 7.96                     |
| 3            | 1093.76                            | 19.94                              | 0.0                                 | 1400.99                             | 1.74                               | 1.74                                | 23078.32                | 420.81                  | 0.0                      | 29560.77                 | 36.67                   | 36.67                    |
| 4            | 1077.36                            | 18.96                              | 0.0                                 | 1429.45                             | 1.38                               | 1.38                                | 20254.29                | 356.51                  | 0.0                      | 26873.63                 | 25.88                   | 25.88                    |
| 5            | 1074.59                            | 21.88                              | 0.0                                 | 1425.78                             | 1.35                               | 1.35                                | 21384.38                | 435.46                  | 0.0                      | 28373.06                 | 26.93                   | 26.93                    |
| 6            | 839.55                             | 45.93                              | 0.0                                 | 1729.12                             | 9.86                               | 9.86                                | 66912.25                | 3660.29                 | 0.0                      | 137811.13                | 785.69                  | 785.69                   |
| 7            | 227.96                             | 20.41                              | 0.0                                 | 2760.06                             | 62.69                              | 62.69                               | 15501.26                | 1388.09                 | 0.0                      | 187684.25                | 4262.59                 | 4262.59                  |
| 8            | 695.13                             | 18.56                              | 0.0                                 | 2031.11                             | 14.50                              | 14.50                               | 35868.54                | 957.94                  | 0.0                      | 104805.25                | 748.34                  | 748.34                   |
| 9            | 1230.92                            | 22.95                              | 0.0                                 | 1177.25                             | 2.48                               | 2.48                                | 66346.38                | 1236.76                 | 0.0                      | 63453.54                 | 133.62                  | 133.62                   |
| 10           | 993.51                             | 19.02                              | 0.0                                 | 1561.03                             | 3.95                               | 3.95                                | 34971.57                | 669.58                  | 0.0                      | 54948.18                 | 138.93                  | 138.93                   |
| 10           | 1086.97                            | 33.77                              | 0.0                                 | 1373.73                             | 1.03                               | 1.03                                | 17826.35                | 553.76                  | 0.0                      | 22529.13                 | 16.87                   | 16.87                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.20                          | 3.04                 | 1154.42                | 17547.18             | 3.509                  | 36.21                  | 550.34               | 0.110                  | 0.52                   | 7.96                 | 0.0016                 |
| 6                       | 0.30                    | 79.70                          | 0.40                 | 839.55                 | 66912.25             | 0.335                  | 45.93                  | 3660.29              | 0.018                  | 9.86                   | 785.69               | 0.0039                 |
| 7                       | 5.00                    | 68.00                          | 5.64                 | 227.96                 | 15501.26             | 1.287                  | 20.41                  | 1388.09              | 0.115                  | 62.69                  | 4262.59              | 0.3538                 |
| 9                       | 6.00                    | 35.20                          | 3.52                 | 993.51                 | 34971.57             | 3.497                  | 19.02                  | 669.58               | 0.067                  | 3.95                   | 138.93               | 0.0139                 |
| 10                      | 4.00                    | 16.40                          | 1.10                 | 1086.97                | 17826.35             | 1.194                  | 33.77                  | 553.76               | 0.037                  | 1.03                   | 16.87                | 0.0011                 |
| TOTAL FOR CYCLE         |                         |                                | 13.701               |                        |                      | 9.822                  |                        |                      | 0.348                  |                        |                      | 0.3743                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.717                  |                        |                      | 0.025                  |                        |                      | 0.0273                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 388 ENGINE TYPE AND MODEL: O-320-83B

SERIAL NUMBER: L-4336-39A

RATED HORSEPOWER: 160.

ENGINE TOTAL TIME: 433. MRS

FUEL: AV GAS 100/130

FUEL M/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 77.50

ATMOSPHERIC PRESSURE: START 29.70 FINISH 29.70

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 36.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARR.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | 12.90                          | 123.00                        | 0.07957           |
| IOLE/TAXI   |                 | 2            | -0.0          | 18.80                          | 209.00                        | 0.08165           |
| RUN UP      |                 | 3            | -0.0          | 24.60                          | 276.00                        | 0.07662           |
| RUN UP-LEAN |                 | 4            | -0.0          | 21.10                          | 235.00                        | 0.07663           |
| RUN UP-RICH |                 | 5            | -0.0          | 21.10                          | 238.00                        | 0.07560           |
| TAKE-OFF    |                 | 6            | -0.0          | 68.00                          | 828.00                        | 0.07890           |
| CLIMB       |                 | 7            | -0.0          | 56.30                          | 752.00                        | 0.07351           |
| DESCENT     |                 | 8            | -0.0          | 50.40                          | 641.00                        | 0.07620           |
| DESCENT     | ON              | 8            | -0.0          | 51.60                          | 535.00                        | 0.08898           |
| APPROACH    |                 | 9            | -0.0          | 34.00                          | 388.00                        | 0.08201           |
| TAXI        |                 | 10           | -0.0          | 17.60                          | 198.00                        | 0.08008           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 426.00                              | -0.00                              | 9.60                     | 5.70                          | 16924.00             | 7.00                | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 2            | 504.00                              | -0.00                              | 9.40                     | 7.70                          | 4936.00              | 42.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 874.00                              | -0.00                              | 8.80                     | 7.40                          | 2929.00              | 96.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 919.00                              | -0.00                              | 8.90                     | 7.30                          | 2875.00              | 72.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 874.00                              | -0.00                              | 8.50                     | 7.50                          | 2821.00              | 73.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1345.00                             | -0.00                              | 7.10                     | 9.70                          | 3688.00              | 509.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1356.00                             | -0.00                              | 4.20                     | 11.70                         | 2549.00              | 1115.00             | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1323.00                             | -0.00                              | 5.80                     | 10.60                         | 2549.00              | 654.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1155.00                             | -0.00                              | 11.90                    | 6.80                          | 3797.00              | 109.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 9.00                     | 8.40                          | 3309.00              | 204.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 5.38                                | -0.00                              | 9.00                     | 7.80                          | 4665.00              | 62.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1141.35                            | 115.24                             | 0.0                                 | 1064.78                             | 0.14                               | 0.14                                | 14723.39                | 1486.57                 | 0.0                      | 13735.68                 | 1.76                    | 1.76                     |
| 2            | 1079.38                            | 32.46                              | 0.0                                 | 1389.24                             | 0.79                               | 0.79                                | 20292.36                | 610.27                  | 0.0                      | 26117.63                 | 14.89                   | 14.89                    |
| 3            | 1077.92                            | 20.55                              | 0.0                                 | 1424.21                             | 1.93                               | 1.93                                | 26516.88                | 505.48                  | 0.0                      | 35035.58                 | 47.52                   | 47.52                    |
| 4            | 1090.53                            | 20.18                              | 0.0                                 | 1405.43                             | 1.45                               | 1.45                                | 23010.13                | 425.71                  | 0.0                      | 29654.48                 | 30.58                   | 30.58                    |
| 5            | 1054.66                            | 20.05                              | 0.0                                 | 1462.15                             | 1.49                               | 1.49                                | 22253.20                | 422.98                  | 0.0                      | 30851.27                 | 31.39                   | 31.39                    |
| 6            | 835.45                             | 24.85                              | 0.0                                 | 1793.38                             | 9.84                               | 9.84                                | 56810.52                | 1690.08                 | 0.0                      | 121949.63                | 668.97                  | 668.97                   |
| 7            | 525.23                             | 18.26                              | 0.0                                 | 2298.91                             | 22.90                              | 22.90                               | 29570.25                | 1027.83                 | 0.0                      | 129428.50                | 1289.44                 | 1289.44                  |
| 8            | 703.54                             | 17.71                              | 0.0                                 | 2020.24                             | 13.03                              | 13.03                               | 35456.33                | 892.49                  | 0.0                      | 101820.25                | 656.73                  | 656.73                   |
| 8            | 1260.02                            | 23.03                              | 0.0                                 | 1131.30                             | 1.90                               | 1.90                                | 65017.04                | 1188.14                 | 0.0                      | 58375.07                 | 97.82                   | 97.82                    |
| 9            | 1025.45                            | 21.59                              | 0.0                                 | 1503.79                             | 3.82                               | 3.82                                | 34865.23                | 734.16                  | 0.0                      | 51129.01                 | 129.81                  | 129.81                   |
| 10           | 1053.03                            | 31.26                              | 0.0                                 | 1433.94                             | 1.19                               | 1.19                                | 18533.28                | 550.18                  | 0.0                      | 25237.27                 | 20.97                   | 20.97                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 18.80                          | 3.76                 | 1079.38                | 20292.36             | 4.058                  | 32.46                  | 610.27               | 0.122                  | 0.79                   | 14.89                | 0.0030                 |
| 6                       | 0.30                    | 68.00                          | 0.34                 | 835.45                 | 56810.52             | 0.284                  | 24.85                  | 1690.08              | 0.008                  | 9.84                   | 668.97               | 0.0033                 |
| 7                       | 5.00                    | 56.30                          | 4.67                 | 525.23                 | 29570.25             | 2.454                  | 18.26                  | 1027.83              | 0.085                  | 22.90                  | 1289.44              | 0.1070                 |
| 9                       | 6.00                    | 34.00                          | 3.40                 | 1025.45                | 34865.23             | 3.487                  | 21.59                  | 734.16               | 0.073                  | 3.82                   | 124.81               | 0.0130                 |
| 10                      | 4.00                    | 17.60                          | 1.18                 | 1053.03                | 18533.28             | 1.242                  | 31.26                  | 550.18               | 0.037                  | 1.19                   | 20.97                | 0.0014                 |
| TOTAL FOR CYCLE         |                         |                                | 13.352               |                        |                      | 11.525                 |                        |                      | 0.326                  |                        |                      | 0.1277                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.863                  |                        |                      | 0.024                  |                        |                      | 0.0096                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 389 ENGINE TYPE AND MODEL: O-320-838 SERIAL NUMBER: L-4336-39

RATED HORSEPOWER: 160.

ENGINE TOTAL TIME: 433. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.50 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.70 FINISH 29.70

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 34.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>PPH | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 165.00                        | 0.07257           |
| IDLE/TAXI   |                 | 2            | -0.0          | 16.40                          | 211.00                        | 0.07319           |
| RUN UP      |                 | 3            | -0.0          | 24.60                          | 249.00                        | 0.07937           |
| RUN UP-LEAN |                 | 4            | -0.0          | 21.10                          | 230.00                        | 0.07878           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.30                          | 250.00                        | 0.07774           |
| TAKE-OFF    |                 | 6            | -0.0          | 72.70                          | 767.00                        | 0.08870           |
| CLIMB       |                 | 7            | -0.0          | 55.10                          | 566.00                        | 0.08972           |
| DESCENT     |                 | 8            | -0.0          | 49.20                          | 522.00                        | 0.08737           |
| DESCENT     |                 | 8            | -0.0          | 52.70                          | 500.00                        | 0.09559           |
| APPROACH    |                 | 9            | -0.0          | 38.70                          | 406.00                        | 0.08790           |
| TAXI        |                 | 10           | -0.0          | 17.60                          | 201.00                        | 0.07719           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPHV | NO<br>(DRY)<br>PPHV | NO<br>2<br>(DRY)<br>PPHV | NO<br>X<br>(DRY)<br>PPHV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 471.00                              | -0.00                              | 6.70                   | 7.50                          | 14410.00             | 38.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 2            | 583.00                              | -0.00                              | 5.10                   | 10.50                         | 3940.00              | 113.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 3            | 942.00                              | -0.00                              | 9.60                   | 7.10                          | 3562.00              | 101.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 975.00                              | -0.00                              | 9.50                   | 7.10                          | 3292.00              | 73.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 964.00                              | -0.00                              | 8.90                   | 7.50                          | 3400.00              | 86.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1199.00                             | -0.00                              | 11.30                  | 7.10                          | 6476.00              | 112.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1211.00                             | -0.00                              | 12.10                  | 6.60                          | 5181.00              | 76.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1222.00                             | -0.00                              | 11.20                  | 7.10                          | 4641.00              | 110.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 14.30                  | 5.40                          | 6476.00              | 45.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1099.00                             | -0.00                              | 11.50                  | 7.00                          | 3670.00              | 86.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 605.00                              | -0.00                              | 8.20                   | 7.90                          | 5559.00              | 57.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 865.39                             | 106.60                             | 0.0                                 | 1522.08                             | 0.81                               | 0.81                                | 13153.93                | 1620.28                 | 0.0                      | 23135.57                 | 12.25                   | 12.25                    |
| 2            | 644.19                             | 28.50                              | 0.0                                 | 2083.88                             | 2.34                               | 2.34                                | 10564.73                | 467.44                  | 0.0                      | 34175.57                 | 38.45                   | 38.45                    |
| 3            | 1137.08                            | 24.16                              | 0.0                                 | 1321.34                             | 1.96                               | 1.96                                | 27972.14                | 594.42                  | 0.0                      | 32505.06                 | 48.34                   | 48.34                    |
| 4            | 1133.68                            | 22.50                              | 0.0                                 | 1331.26                             | 1.43                               | 1.43                                | 23920.55                | 474.74                  | 0.0                      | 28089.49                 | 30.19                   | 30.19                    |
| 5            | 1074.08                            | 23.50                              | 0.0                                 | 1422.15                             | 1.70                               | 1.70                                | 23951.95                | 524.05                  | 0.0                      | 31713.94                 | 38.02                   | 38.02                    |
| 6            | 1198.51                            | 39.34                              | 0.0                                 | 1183.20                             | 1.95                               | 1.95                                | 87131.25                | 2859.88                 | 0.0                      | 86018.56                 | 141.85                  | 141.85                   |
| 7            | 1271.97                            | 31.19                              | 0.0                                 | 1090.12                             | 1.31                               | 1.31                                | 70085.50                | 1718.71                 | 0.0                      | 60065.55                 | 72.31                   | 72.31                    |
| 8            | 1205.85                            | 28.62                              | 0.0                                 | 1201.08                             | 1.95                               | 1.95                                | 59327.66                | 1407.98                 | 0.0                      | 59093.00                 | 95.71                   | 95.71                    |
| 8            | 1419.79                            | 36.82                              | 0.0                                 | 842.41                              | 0.73                               | 0.73                                | 74823.00                | 1940.67                 | 0.0                      | 44394.73                 | 38.68                   | 38.68                    |
| 9            | 1231.39                            | 22.51                              | 0.0                                 | 1177.70                             | 1.51                               | 1.51                                | 47654.91                | 871.01                  | 0.0                      | 45577.04                 | 58.54                   | 58.54                    |
| 10           | 994.60                             | 38.62                              | 0.0                                 | 1505.56                             | 1.14                               | 1.14                                | 17504.91                | 679.65                  | 0.0                      | 26497.89                 | 19.99                   | 19.99                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 16.40                          | 3.28                 | 644.19                 | 10564.73             | 2.113                  | 28.50                  | 467.44               | 0.093                  | 2.34                   | 38.45                | 0.0077                 |
| 6                       | 0.30                    | 72.70                          | 0.36                 | 1198.51                | 87131.25             | 0.436                  | 39.34                  | 2859.88              | 0.014                  | 1.95                   | 141.85               | 0.0007                 |
| 7                       | 5.00                    | 55.10                          | 4.57                 | 1271.97                | 70085.50             | 5.817                  | 31.19                  | 1718.71              | 0.143                  | 1.31                   | 72.31                | 0.0060                 |
| 9                       | 6.00                    | 38.70                          | 3.87                 | 1231.39                | 47654.91             | 4.765                  | 22.51                  | 871.01               | 0.087                  | 1.51                   | 58.54                | 0.0059                 |
| 10                      | 4.00                    | 17.60                          | 1.18                 | 994.60                 | 17504.91             | 1.173                  | 38.62                  | 679.65               | 0.046                  | 1.14                   | 19.99                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 13.266               |                        |                      | 14.304                 |                        |                      | 0.383                  |                        |                      | 0.0216                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.078                  |                        |                      | 0.029                  |                        |                      | 0.0016                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 232 ENGINE TYPE AND MODEL: O-320-E2A

SERIAL NUMBER: L-26201-27AA

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 1394. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 81.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 30.05 FINISH 30.05

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 48.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | 5.90                           | 72.00                         | 0.03326           |
| IOLE/TAXI   |                 | 2            | -0.0          | 5.90                           | 64.00                         | 0.05254           |
| RUN UP      |                 | 3            | -0.0          | 25.80                          | 298.00                        | 0.07922           |
| RUN UP-LEAN |                 | 4            | -0.0          | 23.40                          | 275.00                        | 0.07594           |
| RUN UP-RICH |                 | 5            | -0.0          | 25.80                          | 300.00                        | 0.07767           |
| TAKE-OFF    |                 | 6            | -0.0          | 64.50                          | 734.00                        | 0.08251           |
| CLIMB       |                 | 7            | -0.0          | 66.80                          | 761.00                        | 0.08251           |
| DESCENT     |                 | 8            | -0.0          | 29.30                          | 358.00                        | 0.07628           |
| DESCENT     | ON              | 8            | -0.0          | 41.00                          | 413.00                        | 0.08787           |
| APPROACH    |                 | 9            | -0.0          | 11.70                          | 141.00                        | 0.07562           |
| TAXI        |                 | 10           | -0.0          | 34.00                          | 443.00                        | 0.04145           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 303.00                              | -0.00                              | 2.70                     | 4.20                          | 1734.00              | 25.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 6.10                     | 4.80                          | 2889.00              | 27.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 3            | 874.00                              | -0.00                              | 8.50                     | 8.40                          | 2312.00              | 113.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 785.00                              | -0.00                              | 7.80                     | 8.40                          | 2254.00              | 96.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 942.00                              | -0.00                              | 8.20                     | 8.40                          | 1965.00              | 88.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1211.00                             | -0.00                              | 9.20                     | 8.40                          | 2369.00              | 247.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1211.00                             | -0.00                              | 9.20                     | 8.40                          | 2369.00              | 247.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 6.90                     | 9.50                          | 1849.00              | 384.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 12.20                    | 6.10                          | 4797.00              | 132.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 9            | 852.00                              | -0.00                              | 7.30                     | 8.90                          | 1965.00              | 187.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 415.00                              | -0.00                              | 2.70                     | 6.10                          | 925.00               | 93.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 771.15                             | 28.36                              | 0.0                                 | 1884.78                             | 1.17                               | 1.17                                | 4549.77                 | 167.35                  | 0.0                      | 11120.22                 | 6.92                    | 6.92                     |
| 2            | 1101.40                            | 29.87                              | 0.0                                 | 1361.74                             | 0.80                               | 0.80                                | 6498.25                 | 176.26                  | 0.0                      | 8034.26                  | 4.72                    | 4.72                     |
| 3            | 1002.38                            | 15.62                              | 0.0                                 | 1556.44                             | 2.19                               | 2.19                                | 25861.43                | 402.87                  | 0.0                      | 40156.05                 | 56.47                   | 56.47                    |
| 4            | 959.36                             | 15.88                              | 0.0                                 | 1623.32                             | 1.94                               | 1.94                                | 22448.94                | 371.54                  | 0.0                      | 37985.63                 | 45.38                   | 45.38                    |
| 5            | 986.27                             | 13.54                              | 0.0                                 | 1587.45                             | 1.74                               | 1.74                                | 25445.80                | 349.23                  | 0.0                      | 40956.25                 | 44.85                   | 44.85                    |
| 6            | 1042.01                            | 15.37                              | 0.0                                 | 1494.86                             | 4.60                               | 4.60                                | 67209.38                | 991.18                  | 0.0                      | 96418.25                 | 296.39                  | 296.39                   |
| 7            | 1042.01                            | 15.37                              | 0.0                                 | 1494.86                             | 4.60                               | 4.60                                | 69605.94                | 1026.52                 | 0.0                      | 99856.38                 | 306.96                  | 306.96                   |
| 8            | 840.50                             | 12.90                              | 0.0                                 | 1818.24                             | 7.68                               | 7.68                                | 24626.66                | 377.95                  | 0.0                      | 53274.17                 | 225.12                  | 225.12                   |
| 8            | 1312.42                            | 29.55                              | 0.0                                 | 1031.05                             | 2.33                               | 2.33                                | 53809.28                | 1211.75                 | 0.0                      | 42273.24                 | 95.63                   | 95.63                    |
| 9            | 399.44                             | 13.87                              | 0.0                                 | 1722.97                             | 3.78                               | 3.78                                | 10523.48                | 162.23                  | 0.0                      | 20158.80                 | 44.28                   | 44.28                    |
| 10           | 613.40                             | 12.04                              | 0.0                                 | 2177.44                             | 3.47                               | 3.47                                | 20855.48                | 409.21                  | 0.0                      | 74032.94                 | 117.99                  | 117.99                   |

## LYO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 5.90                           | 1.18                 | 1101.40                | 6498.25              | 1.300                  | 29.87                  | 176.26               | 0.035                  | 6.90                   | 4.72                 | 0.0009                 |
| 6                       | 0.30                    | 64.50                          | 0.32                 | 1042.01                | 67209.38             | 0.336                  | 15.37                  | 991.18               | 0.005                  | 4.60                   | 296.39               | 0.0015                 |
| 7                       | 5.00                    | 66.80                          | 5.54                 | 1042.01                | 69605.94             | 5.777                  | 15.37                  | 1026.52              | 0.085                  | 4.60                   | 306.96               | 0.0255                 |
| 9                       | 6.00                    | 11.70                          | 1.17                 | 899.44                 | 10523.48             | 1.052                  | 13.87                  | 162.23               | 0.016                  | 3.78                   | 44.28                | 0.0044                 |
| 10                      | 4.00                    | 34.00                          | 2.28                 | 613.40                 | 20855.48             | 1.397                  | 12.04                  | 409.21               | 0.027                  | 3.47                   | 117.99               | 0.0079                 |
| TOTAL FOR CYCLE         |                         |                                | 10.495               |                        |                      | 9.863                  |                        |                      | 0.169                  |                        |                      | 0.0402                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.940                  |                        |                      | 0.016                  |                        |                      | 0.0038                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL TO NUMBER: 233 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-26201-27AB  
RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 1394. HRS

FUEL: AV GAS 80/87 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 81.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 30.05 FINISH 30.05

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 48.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 9.40                           | 125.00                        | 0.04048           |
| IDLE/TAXI   |                 | 2            | -0.0          | 11.70                          | 143.00                        | 0.06398           |
| RUN UP      |                 | 3            | -0.0          | 29.30                          | 335.00                        | 0.07887           |
| RUN UP-LEAN |                 | 4            | -0.0          | 29.30                          | 331.00                        | 0.07952           |
| RUN UP-RICH |                 | 5            | -0.0          | 29.30                          | 336.00                        | 0.08061           |
| TAKE-OFF    |                 | 6            | -0.0          | 64.50                          | 725.00                        | 0.08079           |
| CLIMB       |                 | 7            | -0.0          | 64.50                          | 725.00                        | 0.08079           |
| DESCENT     |                 | 8            | -0.0          | 41.00                          | 495.00                        | 0.07639           |
| DESCENT     | ON              | 9            | -0.0          | 56.30                          | 550.00                        | 0.09014           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 208.00                        | 0.07713           |
| TAXI        |                 | 10           | -0.0          | 11.70                          | 153.00                        | 0.05468           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(ORY)<br>PERCENT V | CO<br>2<br>(ORY)<br>PERCENT V | THC<br>(ORY)<br>PPMV | NO<br>(ORY)<br>PPMV | NO<br>2<br>(ORY)<br>PPMV | NO<br>X<br>(ORY)<br>PPMV | ALDEHYDES<br>(ORY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 291.00                              | -0.00                              | 2.10                     | 6.40                          | 1971.00              | 56.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 2            | 448.00                              | -0.00                              | 5.70                     | 7.90                          | 2196.00              | 93.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 897.00                              | -0.00                              | 8.70                     | 8.10                          | 2309.00              | 172.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 841.00                              | -0.00                              | 9.00                     | 7.90                          | 2534.00              | 101.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 919.00                              | -0.00                              | 8.90                     | 8.30                          | 2196.00              | 115.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1233.00                             | -0.00                              | 9.30                     | 7.90                          | 2252.00              | 415.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1233.00                             | -0.00                              | 9.30                     | 7.90                          | 2252.00              | 415.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 7.20                     | 9.20                          | 1858.00              | 659.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1054.00                             | -0.00                              | 13.00                    | 5.70                          | 5237.00              | 111.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 9            | 874.00                              | -0.00                              | 7.70                     | 8.80                          | 2140.00              | 304.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 3.60                     | 8.10                          | 1295.00              | 126.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 487.81                             | 26.22                              | 0.0                                 | 2335.85                             | 2.14                               | 2.14                                | 4585.37                 | 246.48                  | 0.0                      | 21957.00                 | 20.08                   | 20.08                    |
| 2            | 833.26                             | 18.39                              | 0.0                                 | 1814.56                             | 2.23                               | 2.23                                | 9749.15                 | 215.11                  | 0.0                      | 21230.36                 | 26.13                   | 26.13                    |
| 3            | 1032.01                            | 15.69                              | 0.0                                 | 1509.69                             | 3.35                               | 3.35                                | 30237.85                | 459.62                  | 0.0                      | 44233.87                 | 98.19                   | 98.19                    |
| 4            | 1059.97                            | 17.09                              | 0.0                                 | 1461.90                             | 1.95                               | 1.95                                | 31057.14                | 500.81                  | 0.0                      | 42833.55                 | 57.25                   | 57.25                    |
| 5            | 1032.18                            | 14.59                              | 0.0                                 | 1512.45                             | 2.19                               | 2.19                                | 30242.73                | 427.37                  | 0.0                      | 44314.65                 | 64.19                   | 64.19                    |
| 6            | 1078.22                            | 14.95                              | 0.0                                 | 1439.09                             | 7.90                               | 7.90                                | 69545.06                | 964.49                  | 0.0                      | 92821.56                 | 509.74                  | 509.74                   |
| 7            | 1078.22                            | 14.95                              | 0.0                                 | 1439.09                             | 7.90                               | 7.90                                | 69545.06                | 964.49                  | 0.0                      | 92821.56                 | 509.74                  | 509.74                   |
| 8            | 877.00                             | 12.96                              | 0.0                                 | 1760.72                             | 13.18                              | 13.18                               | 35956.86                | 531.42                  | 0.0                      | 72189.69                 | 540.57                  | 540.57                   |
| 9            | 1366.18                            | 31.52                              | 0.0                                 | 941.19                              | 1.92                               | 1.92                                | 76916.00                | 1774.60                 | 0.0                      | 52989.10                 | 107.87                  | 107.87                   |
| 9            | 930.71                             | 14.81                              | 0.0                                 | 1671.25                             | 6.04                               | 6.04                                | 16380.40                | 260.73                  | 0.0                      | 29414.05                 | 106.23                  | 106.23                   |
| 10           | 614.81                             | 12.67                              | 0.0                                 | 2173.50                             | 3.53                               | 3.53                                | 7193.22                 | 148.20                  | 0.0                      | 25429.88                 | 41.35                   | 41.35                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/LK<br>LB FUEL | CO<br>LB/LK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/LK<br>LB FUEL | HC<br>LB/LK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/LK<br>LB FUEL | NO<br>LB/LK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 11.70                          | 2.34                 | 833.26                 | 9749.15              | 1.950                  | 18.39                  | 215.11               | 0.043                  | 2.23                   | 26.13                | 0.0052                 |
| 6                       | 0.30                    | 64.50                          | 0.32                 | 1078.22                | 69545.06             | 0.348                  | 14.95                  | 964.49               | 0.005                  | 7.90                   | 509.74               | 0.0025                 |
| 7                       | 5.00                    | 64.50                          | 5.35                 | 1078.22                | 69545.06             | 5.772                  | 14.95                  | 964.49               | 0.080                  | 7.90                   | 509.74               | 0.0423                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 930.71                 | 16380.40             | 1.638                  | 14.81                  | 260.73               | 0.026                  | 6.04                   | 106.23               | 0.0106                 |
| 10                      | 4.00                    | 11.70                          | 0.78                 | 614.81                 | 7193.22              | 0.482                  | 12.67                  | 148.20               | 0.010                  | 3.53                   | 41.35                | 0.0028                 |
| TOTAL FOR CYCLE         |                         |                                | 10.560               |                        |                      | 10.190                 |                        |                      | 0.164                  |                        |                      | 0.0635                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.965                  |                        |                      | 0.016                  |                        |                      | 0.0060                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 234 ENGINE TYPE AND MODEL: O-320-E2A

SERIAL NUMBER: L-26201-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 1394. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.50 FINISH 84.50

ATMOSPHERIC PRESSURE: START 30.05 FINISH 30.05

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 44.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 9.40                           | 128.00                        | 0.03891           |
| IDLE/TAXI   |                 | 2            | -0.0          | 10.50                          | 135.00                        | 0.05528           |
| RUN UP      |                 | 3            | -0.0          | 27.00                          | 304.00                        | 0.07396           |
| RUN UP-LEAN |                 | 4            | -0.0          | 27.00                          | 306.00                        | 0.07438           |
| RUN UP-RICH |                 | 5            | -0.0          | 28.10                          | 321.00                        | 0.07424           |
| TAKE-OFF    |                 | 6            | -0.0          | 66.80                          | 746.00                        | 0.07809           |
| CLIMB       |                 | 7            | -0.0          | 66.80                          | 746.00                        | 0.07809           |
| DESCENT     |                 | 8            | -0.0          | 37.50                          | 453.00                        | 0.07324           |
| DESCENT     | ON              | 8            | -0.0          | 50.40                          | 493.00                        | 0.08313           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 208.00                        | 0.07037           |
| TAXI        |                 | 10           | -0.0          | 10.50                          | 139.00                        | 0.04961           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 314.00                              | -0.00                              | 1.70                     | 6.50                          | 1641.00              | -0.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | 415.00                              | -0.00                              | 4.00                     | 7.80                          | 1415.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 3            | 942.00                              | -0.00                              | 8.40                     | 7.30                          | 2151.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 874.00                              | -0.00                              | 8.30                     | 7.50                          | 2207.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 986.00                              | -0.00                              | 8.20                     | 7.60                          | 1981.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1222.00                             | -0.00                              | 9.10                     | 7.50                          | 2151.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1222.00                             | -0.00                              | 9.10                     | 7.50                          | 2151.00              | -0.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 6.90                     | 8.80                          | 1755.00              | -0.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 11.90                    | 5.30                          | 5037.00              | -0.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 852.00                              | -0.00                              | 7.00                     | 8.00                          | 1981.00              | -0.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 3.10                     | 7.50                          | 1075.00              | -0.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 410.61                             | 22.70                              | 0.0                                 | 2466.80                             | -0.00                              | -0.00                               | 3859.75                 | 213.39                  | 0.0                      | 23187.94                 | -0.00                   | -0.00                    |
| 2            | 676.71                             | 13.71                              | 0.0                                 | 2073.36                             | -0.00                              | -0.00                               | 7105.46                 | 143.96                  | 0.0                      | 21770.32                 | -0.00                   | -0.00                    |
| 3            | 1066.28                            | 15.64                              | 0.0                                 | 1455.97                             | -0.00                              | -0.00                               | 28789.59                | 422.22                  | 0.0                      | 39311.28                 | -0.00                   | -0.00                    |
| 4            | 1046.64                            | 15.94                              | 0.0                                 | 1486.00                             | -0.00                              | -0.00                               | 28259.35                | 430.36                  | 0.0                      | 40122.08                 | -0.00                   | -0.00                    |
| 5            | 1035.49                            | 14.33                              | 0.0                                 | 1507.94                             | -0.00                              | -0.00                               | 29097.35                | 402.60                  | 0.0                      | 42373.21                 | -0.00                   | -0.00                    |
| 6            | 1093.31                            | 14.80                              | 0.0                                 | 1415.80                             | -0.00                              | -0.00                               | 73033.06                | 988.70                  | 0.0                      | 94575.38                 | -0.00                   | -0.00                    |
| 7            | 1093.31                            | 14.80                              | 0.0                                 | 1415.80                             | -0.00                              | -0.00                               | 73033.06                | 988.70                  | 0.0                      | 94575.38                 | -0.00                   | -0.00                    |
| 8            | 878.06                             | 12.79                              | 0.0                                 | 1759.53                             | -0.00                              | -0.00                               | 32927.20                | 479.65                  | 0.0                      | 65982.13                 | -0.00                   | -0.00                    |
| 8            | 1357.95                            | 32.92                              | 0.0                                 | 950.28                              | -0.00                              | -0.00                               | 68440.81                | 1659.15                 | 0.0                      | 47894.15                 | -0.00                   | -0.00                    |
| 9            | 930.49                             | 15.08                              | 0.0                                 | 1670.86                             | -0.00                              | -0.00                               | 16376.57                | 265.43                  | 0.0                      | 29407.16                 | -0.00                   | -0.00                    |
| 10           | 584.89                             | 11.62                              | 0.0                                 | 2223.38                             | -0.00                              | -0.00                               | 6141.36                 | 121.97                  | 0.0                      | 23345.46                 | -0.00                   | -0.00                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 10.50                          | 2.10                 | 676.71                 | 7105.46              | 1.421                  | 13.71                  | 143.96               | 0.029                  | -0.00                  | -0.00                | -0.0000                |
| 6                       | 0.30                    | 66.80                          | 0.33                 | 1093.31                | 73033.06             | 0.365                  | 14.80                  | 988.70               | 0.005                  | -0.00                  | -0.00                | -0.0000                |
| 7                       | 5.00                    | 66.80                          | 5.54                 | 1093.31                | 73033.06             | 6.062                  | 14.80                  | 988.70               | 0.082                  | -0.00                  | -0.00                | -0.0000                |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 930.49                 | 16376.57             | 1.638                  | 15.08                  | 265.43               | 0.027                  | -0.00                  | -0.00                | -0.0000                |
| 10                      | 4.00                    | 10.50                          | 0.70                 | 584.89                 | 6141.36              | 0.411                  | 11.62                  | 121.97               | 0.008                  | -0.00                  | -0.00                | -0.0000                |
| TOTAL FOR CYCLE         |                         |                                | 10.442               |                        |                      | 9.897                  |                        |                      | 0.151                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.948                  |                        |                      | 0.014                  |                        |                      | -0.0000                |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 235 ENGINE TYPE AND MODEL: D-320-E2A

SERIAL NUMBER: L-27474-27AA

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 1025. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 29.76 FINISH 29.76

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 17.60                          | 202.00                        | 0.03248           |
| IDLE/TAXI   |                 | 2            | -0.0          | 23.40                          | 257.00                        | 0.05133           |
| RUN UP      |                 | 3            | -0.0          | 41.00                          | 450.00                        | 0.08189           |
| RUN UP-LEAN |                 | 4            | -0.0          | 32.80                          | 363.00                        | 0.08117           |
| RUN UP-RICH |                 | 5            | -0.0          | 41.00                          | 451.00                        | 0.08176           |
| TAKE-OFF    |                 | 6            | -0.0          | 73.80                          | 785.00                        | 0.08619           |
| CLIMB       |                 | 7            | -0.0          | 73.80                          | 785.00                        | 0.08619           |
| DESCENT     |                 | 8            | -0.0          | 51.60                          | 569.00                        | 0.08219           |
| DESCENT     | ON              | 8            | -0.0          | 51.60                          | 570.00                        | 0.08267           |
| APPROACH    |                 | 9            | -0.0          | 28.10                          | 305.00                        | 0.08332           |
| TAXI        |                 | 10           | -0.0          | 19.90                          | 243.00                        | 0.04515           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 325.00                              | -0.00                              | 3.30                     | 3.40                          | 1821.00              | -0.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 6.00                     | 4.70                          | 2269.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 3            | 964.00                              | -0.00                              | 9.80                     | 7.50                          | 3277.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 897.00                              | -0.00                              | 9.60                     | 7.60                          | 2829.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 998.00                              | -0.00                              | 9.80                     | 7.50                          | 2997.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1199.00                             | -0.00                              | 11.10                    | 7.10                          | 3109.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1199.00                             | -0.00                              | 11.10                    | 7.10                          | 3109.00              | -0.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1155.00                             | -0.00                              | 9.80                     | 7.60                          | 2997.00              | -0.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1121.00                             | -0.00                              | 9.80                     | 7.70                          | 3109.00              | -0.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 897.00                              | -0.00                              | 10.20                    | 7.30                          | 4174.00              | -0.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 3.90                     | 5.60                          | 1597.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 968.71                             | 30.62                              | 0.0                                 | 1568.19                             | -0.00                              | -0.00                               | 17049.32                | 538.83                  | 0.0                      | 27600.08                 | -0.00                   | -0.00                    |
| 2            | 1109.32                            | 24.03                              | 0.0                                 | 1365.34                             | -0.00                              | -0.00                               | 25958.02                | 562.21                  | 0.0                      | 31948.97                 | -0.00                   | -0.00                    |
| 3            | 1123.14                            | 21.51                              | 0.0                                 | 1350.53                             | -0.00                              | -0.00                               | 46048.57                | 881.88                  | 0.0                      | 55371.89                 | -0.00                   | -0.00                    |
| 4            | 1109.33                            | 18.72                              | 0.0                                 | 1379.88                             | -0.00                              | -0.00                               | 36385.91                | 614.10                  | 0.0                      | 45259.92                 | -0.00                   | -0.00                    |
| 5            | 1124.92                            | 19.70                              | 0.0                                 | 1352.68                             | -0.00                              | -0.00                               | 46121.82                | 807.82                  | 0.0                      | 55459.99                 | -0.00                   | -0.00                    |
| 6            | 1211.43                            | 19.43                              | 0.0                                 | 1217.51                             | -0.00                              | -0.00                               | 89403.19                | 1434.16                 | 0.0                      | 89851.81                 | -0.00                   | -0.00                    |
| 7            | 1211.43                            | 19.43                              | 0.0                                 | 1217.51                             | -0.00                              | -0.00                               | 89403.19                | 1434.16                 | 0.0                      | 89851.81                 | -0.00                   | -0.00                    |
| 8            | 1116.57                            | 19.59                              | 0.0                                 | 1362.97                             | -0.00                              | -0.00                               | 57718.06                | 1010.92                 | 0.0                      | 70329.44                 | -0.00                   | -0.00                    |
| 8            | 1111.58                            | 20.20                              | 0.0                                 | 1372.29                             | -0.00                              | -0.00                               | 57357.70                | 1042.15                 | 0.0                      | 70809.94                 | -0.00                   | -0.00                    |
| 9            | 1150.08                            | 26.95                              | 0.0                                 | 1293.27                             | -0.00                              | -0.00                               | 32317.15                | 757.41                  | 0.0                      | 36340.76                 | -0.00                   | -0.00                    |
| 10           | 815.65                             | 19.13                              | 0.0                                 | 1840.20                             | -0.00                              | -0.00                               | 16231.38                | 380.66                  | 0.0                      | 36619.93                 | -0.00                   | -0.00                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 23.40                          | 4.68                 | 1109.32                | 25958.02             | 5.192                  | 24.03                  | 562.21               | 0.112                  | -0.00                  | -0.00                | -0.0000                |
| 6                       | 0.30                    | 73.80                          | 0.37                 | 1211.43                | 89403.19             | 0.447                  | 19.43                  | 1434.16              | 0.007                  | -0.00                  | -0.00                | -0.0000                |
| 7                       | 5.00                    | 73.80                          | 6.13                 | 1211.43                | 89403.19             | 7.420                  | 19.43                  | 1434.16              | 0.119                  | -0.00                  | -0.00                | -0.0000                |
| 9                       | 6.00                    | 28.10                          | 2.81                 | 1150.08                | 32317.15             | 3.232                  | 26.95                  | 757.41               | 0.076                  | -0.00                  | -0.00                | -0.0000                |
| 10                      | 4.00                    | 19.90                          | 1.33                 | 815.65                 | 16231.38             | 1.088                  | 19.13                  | 380.66               | 0.026                  | -0.00                  | -0.00                | -0.0000                |
| TOTAL FOR CYCLE         |                         |                                | 15.318               |                        |                      | 17.378                 |                        |                      | 0.340                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.135                  |                        |                      | 0.022                  |                        |                      | -0.0000                |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 236 ENGINE TYPE AND MODEL: D-320-E2A

SERIAL NUMBER: L-27474-27AB

RATED HORSEPOWER: 190.

ENGINE TOTAL TIME: 1026. MRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.50 FINISH 77.50

ATMOSPHERIC PRESSURE: START 29.76 FINISH 29.76

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 17.60                          | 214.00                        | 0.02283           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.30                          | 256.00                        | 0.03554           |
| RUN UP      |                 | 3            | -0.0          | 37.50                          | 410.00                        | 0.05643           |
| RUN UP-LEAN |                 | 4            | -0.0          | 34.00                          | 371.00                        | 0.05455           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.00                          | 379.00                        | 0.05859           |
| TAKE-OFF    |                 | 6            | -0.0          | 70.30                          | 740.00                        | 0.06733           |
| CLIMB       |                 | 7            | -0.0          | 70.30                          | 740.00                        | 0.06733           |
| DESCENT     |                 | 8            | -0.0          | 51.60                          | 561.00                        | 0.06189           |
| DESCENT     | ON              | 8            | -0.0          | 52.70                          | 575.00                        | 0.05917           |
| APPROACH    |                 | 9            | -0.0          | 28.10                          | 301.00                        | 0.05476           |
| TAXI        |                 | 10           | -0.0          | 22.30                          | 271.00                        | 0.03345           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 269.00                              | -0.00                              | 1.90                     | 2.80                          | 1269.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 3.70                     | 3.70                          | 1379.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 3            | 986.00                              | -0.00                              | 6.70                     | 5.10                          | 2317.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 919.00                              | -0.00                              | 6.50                     | 4.90                          | 2207.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1166.00                             | -0.00                              | 6.70                     | 5.60                          | 2207.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1199.00                             | -0.00                              | 8.70                     | 5.40                          | 2648.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1199.00                             | -0.00                              | 9.70                     | 5.40                          | 2648.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1155.00                             | -0.00                              | 7.50                     | 5.50                          | 2152.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1121.00                             | -0.00                              | 7.10                     | 5.30                          | 2262.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 6.70                     | 4.70                          | 2538.00              | -0.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 504.00                              | -0.00                              | 2.90                     | 4.10                          | 1104.00              | -0.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 795.22                             | 30.42                              | 0.0                                 | 1841.32                             | -0.00                              | -0.00                               | 13995.86                | 535.37                  | 0.0                      | 32407.25                 | -0.00                   | -0.00                    |
| 2            | 991.64                             | 21.17                              | 0.0                                 | 1558.09                             | -0.00                              | -0.00                               | 22113.51                | 472.03                  | 0.0                      | 34745.30                 | -0.00                   | -0.00                    |
| 3            | 1124.99                            | 22.28                              | 0.0                                 | 1345.50                             | -0.00                              | -0.00                               | 42187.24                | 835.56                  | 0.0                      | 50456.21                 | -0.00                   | -0.00                    |
| 4            | 1130.01                            | 21.97                              | 0.0                                 | 1338.46                             | -0.00                              | -0.00                               | 38420.38                | 747.13                  | 0.0                      | 45507.49                 | -0.00                   | -0.00                    |
| 5            | 1081.06                            | 20.39                              | 0.0                                 | 1419.71                             | -0.00                              | -0.00                               | 36755.89                | 693.43                  | 0.0                      | 48270.14                 | -0.00                   | -0.00                    |
| 6            | 1223.55                            | 21.33                              | 0.0                                 | 1193.26                             | -0.00                              | -0.00                               | 86015.50                | 1499.41                 | 0.0                      | 83886.00                 | -0.00                   | -0.00                    |
| 7            | 1223.55                            | 21.33                              | 0.0                                 | 1193.26                             | -0.00                              | -0.00                               | 86015.50                | 1499.41                 | 0.0                      | 83886.00                 | -0.00                   | -0.00                    |
| 8            | 1146.54                            | 18.84                              | 0.0                                 | 1321.08                             | -0.00                              | -0.00                               | 59161.46                | 972.22                  | 0.0                      | 68167.69                 | -0.00                   | -0.00                    |
| 8            | 1136.02                            | 20.73                              | 0.0                                 | 1332.43                             | -0.00                              | -0.00                               | 59868.45                | 1092.39                 | 0.0                      | 70218.88                 | -0.00                   | -0.00                    |
| 9            | 1161.47                            | 25.20                              | 0.0                                 | 1280.18                             | -0.00                              | -0.00                               | 32637.37                | 708.07                  | 0.0                      | 35972.99                 | -0.00                   | -0.00                    |
| 10           | 823.96                             | 17.96                              | 0.0                                 | 1830.33                             | -0.00                              | -0.00                               | 18374.28                | 400.61                  | 0.0                      | 40816.39                 | -0.00                   | -0.00                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 22.30                          | 4.46                 | 991.64                 | 22113.51             | 4.423                  | 21.17                  | 472.03               | 0.094                  | -0.00                  | -0.00                | -0.0000                |
| 6                       | 0.30                    | 70.30                          | 0.35                 | 1223.55                | 86015.50             | 0.430                  | 21.33                  | 1499.41              | 0.007                  | -0.00                  | -0.00                | -0.0000                |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1223.55                | 86015.50             | 7.139                  | 21.33                  | 1499.41              | 0.124                  | -0.00                  | -0.00                | -0.0000                |
| 9                       | 6.00                    | 28.10                          | 2.81                 | 1161.47                | 32637.37             | 3.264                  | 25.20                  | 708.07               | 0.071                  | -0.00                  | -0.00                | -0.0000                |
| 10                      | 4.00                    | 22.30                          | 1.49                 | 823.96                 | 18374.28             | 1.231                  | 17.96                  | 400.61               | 0.027                  | -0.00                  | -0.00                | -0.0000                |
| TOTAL FOR CYCLE         |                         |                                | 14.950               |                        |                      | 16.487                 |                        |                      | 0.324                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.103                  |                        |                      | 0.022                  |                        |                      | -0.0000                |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 237 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-27474-27AC  
RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 1029. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.50 FINISH 76.50

ATMOSPHERIC PRESSURE: START 29.76 FINISH 29.76

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TFST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 19.90                          | 249.00                        | 0.03371           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 237.00                        | 0.05411           |
| RUN UP      |                 | 3            | -0.0          | 34.00                          | 369.00                        | 0.08311           |
| RUN UP-LEAN |                 | 4            | -0.0          | 32.80                          | 359.00                        | 0.08335           |
| RUN UP-RICH |                 | 5            | -0.0          | 32.80                          | 359.00                        | 0.08283           |
| TAKE-OFF    |                 | 6            | -0.0          | 72.70                          | 764.00                        | 0.08672           |
| CLIMB       |                 | 7            | -0.0          | 72.70                          | 764.00                        | 0.08672           |
| DESCENT     |                 | 8            | -0.0          | 50.40                          | 552.00                        | 0.08357           |
| DESCENT     | ON              | 8            | -0.0          | 50.40                          | 562.00                        | 0.08162           |
| APPROACH    |                 | 9            | -0.0          | 25.80                          | 280.00                        | 0.08232           |
| TAXI        |                 | 10           | -0.0          | 21.10                          | 261.00                        | 0.05829           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 56.00                               | -0.00                              | 2.50                     | 4.50                          | 1793.00              | 11.00               | -0.00                    | -0.00                    | 7.00               | -0.70 | -0.00        |
| 2            | 415.00                              | -0.00                              | 5.20                     | 6.20                          | 2014.00              | 20.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 919.00                              | -0.00                              | 10.20                    | 7.30                          | 3724.00              | 67.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 830.00                              | -0.00                              | 10.10                    | 7.50                          | 3393.00              | 43.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 986.00                              | -0.00                              | 10.00                    | 7.50                          | 3283.00              | 51.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1188.00                             | -0.00                              | 11.40                    | 6.90                          | 3062.00              | 59.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1188.00                             | -0.00                              | 11.40                    | 6.90                          | 3062.00              | 59.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 10.10                    | 7.60                          | 2952.00              | 78.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1121.00                             | -0.00                              | 9.50                     | 7.80                          | 2952.00              | 140.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 10.10                    | 7.20                          | 3945.00              | 59.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 504.00                              | -0.00                              | 4.60                     | 7.80                          | 1904.00              | 36.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 703.49                             | 28.90                              | 0.0                                 | 1989.62                             | 0.51                               | 0.51                                | 13999.50                | 575.04                  | 0.0                      | 39593.46                 | 10.12                   | 10.12                    |
| 2            | 905.51                             | 20.09                              | 0.0                                 | 1696.37                             | 0.57                               | 0.57                                | 18019.70                | 399.71                  | 0.0                      | 33757.81                 | 11.38                   | 11.38                    |
| 3            | 1152.97                            | 24.11                              | 0.0                                 | 1296.52                             | 1.24                               | 1.24                                | 39201.08                | 819.70                  | 0.0                      | 44081.74                 | 42.30                   | 42.30                    |
| 4            | 1137.41                            | 21.80                              | 0.0                                 | 1327.08                             | 0.80                               | 0.80                                | 37307.10                | 717.79                  | 0.0                      | 43528.09                 | 26.09                   | 26.09                    |
| 5            | 1133.16                            | 21.31                              | 0.0                                 | 1335.34                             | 0.95                               | 0.95                                | 37167.69                | 698.85                  | 0.0                      | 43799.09                 | 31.14                   | 31.14                    |
| 6            | 1237.80                            | 19.04                              | 0.0                                 | 1177.15                             | 1.05                               | 1.05                                | 89937.63                | 1384.29                 | 0.0                      | 85578.69                 | 76.50                   | 76.50                    |
| 7            | 1237.80                            | 19.04                              | 0.0                                 | 1177.15                             | 1.05                               | 1.05                                | 89937.63                | 1384.29                 | 0.0                      | 85578.69                 | 76.50                   | 76.50                    |
| 8            | 1133.88                            | 18.98                              | 0.0                                 | 1340.59                             | 1.44                               | 1.44                                | 57147.47                | 956.62                  | 0.0                      | 67565.81                 | 72.49                   | 72.49                    |
| 8            | 1090.77                            | 19.41                              | 0.0                                 | 1407.15                             | 2.64                               | 2.64                                | 54974.58                | 978.36                  | 0.0                      | 70920.31                 | 133.07                  | 133.07                   |
| 9            | 1153.15                            | 25.80                              | 0.0                                 | 1291.62                             | 1.11                               | 1.11                                | 29751.19                | 665.54                  | 0.0                      | 33323.73                 | 28.55                   | 28.55                    |
| 10           | 738.11                             | 17.50                              | 0.0                                 | 1966.51                             | 0.95                               | 0.95                                | 15574.08                | 369.20                  | 0.0                      | 41493.24                 | 20.02                   | 20.02                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.90                          | 1.98                 | 905.51                 | 18019.70             | 3.604                  | 20.09                  | 399.71               | 0.080                  | 0.57                   | 11.38                | 0.0023                 |
| 6                       | 0.30                    | 72.70                          | 0.36                 | 1237.80                | 89987.63             | 0.450                  | 19.04                  | 1384.29              | 0.007                  | 1.05                   | 76.50                | 0.0004                 |
| 7                       | 5.00                    | 72.70                          | 6.03                 | 1237.80                | 89987.63             | 7.469                  | 19.04                  | 1384.29              | 0.115                  | 1.05                   | 76.50                | 0.0063                 |
| 9                       | 6.00                    | 25.80                          | 2.58                 | 1153.15                | 29751.19             | 2.975                  | 25.80                  | 665.54               | 0.067                  | 1.11                   | 28.55                | 0.0029                 |
| 10                      | 4.00                    | 21.10                          | 1.41                 | 738.11                 | 15574.08             | 1.043                  | 17.50                  | 369.20               | 0.025                  | 0.95                   | 20.02                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 14.371               |                        |                      | 15.541                 |                        |                      | 0.293                  |                        |                      | 0.0132                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.081                  |                        |                      | 0.020                  |                        |                      | 0.0009                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 241 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-27848-27AA

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 767. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 81.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.90                          | 156.00                        | 0.03408           |
| IDLE/TAXI   |                 | 2            | -0.0          | 14.10                          | 170.00                        | 0.05387           |
| RUN UP      |                 | 3            | -0.0          | 35.20                          | 401.00                        | 0.08032           |
| RUN UP-LEAN |                 | 4            | -0.0          | 35.20                          | 404.00                        | 0.08017           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.00                          | 392.00                        | 0.07968           |
| TAKE-OFF    |                 | 6            | -0.0          | 73.80                          | 808.00                        | 0.08647           |
| CLIMB       |                 | 7            | -0.0          | 73.80                          | 808.00                        | 0.08647           |
| DESCENT     |                 | 8            | -0.0          | 51.60                          | 579.00                        | 0.08444           |
| DESCENT     | ON              | 8            | -0.0          | 44.50                          | 525.00                        | 0.07802           |
| APPROACH    |                 | 9            | -0.0          | 22.30                          | 245.00                        | 0.08190           |
| TAXI        |                 | 10           | -0.0          | 11.70                          | 152.00                        | 0.04331           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 381.00                              | -0.00                              | 3.00                     | 4.10                          | 1436.00              | 17.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 2            | 471.00                              | -0.00                              | 4.90                     | 6.50                          | 1661.00              | 46.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 3            | 998.00                              | -0.00                              | 8.90                     | 8.20                          | 2506.00              | 189.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 942.00                              | -0.00                              | 8.70                     | 8.40                          | 2337.00              | 136.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1076.00                             | -0.00                              | 8.60                     | 8.40                          | 2280.00              | 146.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1379.00                             | -0.00                              | 10.60                    | 7.80                          | 2337.00              | 159.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1379.00                             | -0.00                              | 10.60                    | 7.80                          | 2337.00              | 159.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 8            | 1312.00                             | -0.00                              | 9.80                     | 8.20                          | 2337.00              | 99.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1312.00                             | -0.00                              | 7.90                     | 8.80                          | 2055.00              | 321.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 1031.00                             | -0.00                              | 9.80                     | 7.50                          | 3294.00              | 96.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 594.00                              | -0.00                              | 2.90                     | 6.30                          | 985.00               | 46.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 836.70                             | 22.94                              | 0.0                                 | 1796.68                             | 0.78                               | 0.78                                | 10793.39                | 795.89                  | 0.0                      | 23177.09                 | 10.05                   | 10.05                    |
| 2            | 855.88                             | 16.62                              | 0.0                                 | 1783.88                             | 1.32                               | 1.32                                | 12067.85                | 234.29                  | 0.0                      | 25152.75                 | 18.61                   | 18.61                    |
| 3            | 1036.28                            | 16.71                              | 0.0                                 | 1500.17                             | 3.61                               | 3.61                                | 36477.06                | 588.24                  | 0.0                      | 52805.94                 | 127.24                  | 127.24                   |
| 4            | 1013.98                            | 15.60                              | 0.0                                 | 1538.25                             | 2.60                               | 2.60                                | 35692.12                | 549.11                  | 0.0                      | 54146.53                 | 91.65                   | 91.65                    |
| 5            | 1008.48                            | 15.31                              | 0.0                                 | 1547.69                             | 2.81                               | 2.81                                | 34288.16                | 520.63                  | 0.0                      | 52621.50                 | 95.61                   | 95.61                    |
| 6            | 1149.23                            | 14.51                              | 0.0                                 | 1328.73                             | 2.83                               | 2.83                                | 84813.44                | 1070.93                 | 0.0                      | 98059.94                 | 208.97                  | 208.97                   |
| 7            | 1149.23                            | 14.51                              | 0.0                                 | 1328.73                             | 2.83                               | 2.83                                | 84813.44                | 1070.93                 | 0.0                      | 98059.94                 | 208.97                  | 208.97                   |
| 8            | 1085.81                            | 14.83                              | 0.0                                 | 1427.51                             | 1.80                               | 1.80                                | 56027.69                | 765.21                  | 0.0                      | 73659.44                 | 92.97                   | 92.97                    |
| 8            | 944.06                             | 14.06                              | 0.0                                 | 1652.32                             | 6.30                               | 6.30                                | 42010.79                | 625.88                  | 0.0                      | 73528.31                 | 280.39                  | 280.39                   |
| 9            | 1123.03                            | 21.62                              | 0.0                                 | 1350.40                             | 1.81                               | 1.81                                | 25043.50                | 482.10                  | 0.0                      | 30113.98                 | 40.30                   | 40.30                    |
| 10           | 630.07                             | 12.26                              | 0.0                                 | 2150.64                             | 1.64                               | 1.64                                | 7371.78                 | 143.40                  | 0.0                      | 25162.49                 | 19.21                   | 19.21                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 14.10                          | 2.82                 | 855.88                 | 12067.85             | 2.414                  | 16.62                  | 234.29               | 0.047                  | 1.32                   | 18.61                | 0.0037                 |
| 6                       | 0.30            | 73.80                          | 0.37                 | 1149.23                | 84813.44             | 0.424                  | 14.51                  | 1070.93              | 0.005                  | 2.83                   | 208.97               | 0.0010                 |
| 7                       | 5.00            | 73.80                          | 6.13                 | 1149.23                | 84813.44             | 7.040                  | 14.51                  | 1070.93              | 0.089                  | 2.83                   | 208.97               | 0.0173                 |
| 9                       | 6.00            | 22.30                          | 2.23                 | 1123.03                | 25043.50             | 2.504                  | 21.62                  | 482.10               | 0.048                  | 1.81                   | 40.30                | 0.0040                 |
| 10                      | 4.00            | 11.70                          | 0.78                 | 630.07                 | 7371.78              | 0.494                  | 12.26                  | 143.40               | 0.010                  | 1.64                   | 19.21                | 0.0013                 |
| TOTAL FOR CYCLE         |                 |                                | 12.328               |                        |                      | 12.875                 |                        |                      | 0.199                  |                        |                      | 0.0274                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 1.044                  |                        |                      | 0.016                  |                        |                      | 0.0022                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 242 ENGINE TYPE AND MODEL: D-320-E2A

SERIAL NUMBER: L-27848-27AB

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 768. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.50 FINISH 82.50

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LW     |                 | 1            | -0.0          | 12.90                          | 168.00                        | 0.03146           |
| IDLE/TAXI   |                 | 2            | -0.0          | 12.90                          | 168.00                        | 0.04987           |
| RUN UP      |                 | 3            | -0.0          | 32.80                          | 373.00                        | 0.08085           |
| RUN UP-LEAN |                 | 4            | -0.0          | 31.60                          | 360.00                        | 0.08077           |
| RUN UP-RICH |                 | 5            | -0.0          | 32.80                          | 375.00                        | 0.08076           |
| TAKE-OFF    |                 | 6            | -0.0          | 70.30                          | 765.00                        | 0.08571           |
| CLIMB       |                 | 7            | -0.0          | 70.30                          | 765.00                        | 0.08571           |
| DESCENT     |                 | 8            | -0.0          | 50.40                          | 567.00                        | 0.08173           |
| DESCENT     | ON              | 9            | -0.0          | 41.00                          | 485.00                        | 0.07849           |
| APPROACH    |                 | 10           | -0.0          | 17.60                          | 193.00                        | 0.08103           |
| TAXI        |                 | 10           | -0.0          | 11.70                          | 154.00                        | 0.04238           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 291.00                              | -0.00                              | 1.90                     | 4.70                          | 1081.00              | 26.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 3.50                     | 7.10                          | 1414.00              | 59.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 964.00                              | -0.00                              | 9.00                     | 8.20                          | 2634.00              | 218.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 852.00                              | -0.00                              | 9.00                     | 8.20                          | 2468.00              | 141.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1244.00                             | -0.00                              | 8.90                     | 8.30                          | 2523.00              | 139.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 10.60                    | 7.60                          | 2523.00              | 160.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1278.00                             | -0.00                              | 10.60                    | 7.60                          | 2523.00              | 160.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 9.40                     | 8.00                          | 2357.00              | 131.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | 1211.00                             | -0.00                              | 7.90                     | 8.90                          | 2135.00              | 399.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 964.00                              | -0.00                              | 9.70                     | 7.40                          | 3355.00              | 114.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 471.00                              | -0.00                              | 2.60                     | 6.40                          | 1026.00              | 61.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 572.21                             | 18.65                              | 0.0                                 | 2224.02                             | 1.29                               | 1.29                                | 7381.51                 | 240.53                  | 0.0                      | 28689.85                 | 16.59                   | 16.59                    |
| 2            | 658.28                             | 15.23                              | 0.0                                 | 2098.16                             | 1.82                               | 1.82                                | 8491.78                 | 196.48                  | 0.0                      | 27066.19                 | 23.51                   | 23.51                    |
| 3            | 1041.16                            | 17.45                              | 0.0                                 | 1490.48                             | 4.14                               | 4.14                                | 34149.87                | 572.41                  | 0.0                      | 48887.59                 | 135.87                  | 135.87                   |
| 4            | 1042.15                            | 16.37                              | 0.0                                 | 1491.89                             | 2.68                               | 2.68                                | 32931.74                | 517.21                  | 0.0                      | 47143.83                 | 84.74                   | 84.74                    |
| 5            | 1030.24                            | 16.73                              | 0.0                                 | 1509.61                             | 2.64                               | 2.64                                | 33791.91                | 548.64                  | 0.0                      | 49515.27                 | 86.69                   | 86.69                    |
| 6            | 1160.53                            | 15.82                              | 0.0                                 | 1307.38                             | 2.88                               | 2.88                                | 81585.38                | 1112.16                 | 0.0                      | 91909.06                 | 202.28                  | 202.28                   |
| 7            | 1160.53                            | 15.82                              | 0.0                                 | 1307.38                             | 2.88                               | 2.88                                | 81585.38                | 1112.16                 | 0.0                      | 91909.06                 | 202.28                  | 202.28                   |
| 8            | 1076.80                            | 15.46                              | 0.0                                 | 1434.92                             | 2.46                               | 2.46                                | 54270.95                | 779.37                  | 0.0                      | 72571.75                 | 124.23                  | 124.23                   |
| 9            | 938.07                             | 14.52                              | 0.0                                 | 1660.49                             | 1.78                               | 1.78                                | 38460.88                | 595.30                  | 0.0                      | 68080.06                 | 319.07                  | 319.07                   |
| 10           | 1123.93                            | 22.26                              | 0.0                                 | 1347.22                             | 2.17                               | 2.17                                | 19781.14                | 391.85                  | 0.0                      | 23710.98                 | 38.19                   | 38.19                    |
| 10           | 577.04                             | 13.04                              | 0.0                                 | 2231.80                             | 2.22                               | 2.22                                | 6751.42                 | 152.59                  | 0.0                      | 26112.01                 | 26.02                   | 26.02                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 12.90                          | 2.58                 | 658.28                 | 8491.78              | 1.698                  | 15.23                  | 196.48               | 0.039                  | 1.82                   | 23.51                | 0.0047                 |
| 6                       | 0.30                    | 70.30                          | 0.35                 | 1160.53                | 81585.38             | 0.408                  | 15.82                  | 1112.16              | 0.006                  | 2.88                   | 202.28               | 0.0010                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1160.53                | 81585.38             | 6.772                  | 15.82                  | 1112.16              | 0.092                  | 2.88                   | 202.28               | 0.0168                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 1123.93                | 19781.14             | 1.978                  | 22.26                  | 391.85               | 0.039                  | 2.17                   | 38.19                | 0.0038                 |
| 10                      | 4.00                    | 11.70                          | 0.78                 | 577.04                 | 6751.42              | 0.452                  | 13.04                  | 152.59               | 0.010                  | 2.22                   | 26.02                | 0.0017                 |
| TOTAL FOR CYCLE         |                         |                                | 11.310               |                        |                      | 11.308                 |                        |                      | 0.187                  |                        |                      | 0.0281                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.000                  |                        |                      | 0.016                  |                        |                      | 0.0025                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 243 ENGINE TYPE AND MODEL: O-320-E2A

SERIAL NUMBER: L-27848-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 768. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 34.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | 11.70                          | 159.00                        | 0.03039           |
| IOLE/TAXI   |                 | 2            | -0.0          | 11.70                          | 154.00                        | 0.04878           |
| RUN UP      |                 | 3            | -0.0          | 31.60                          | 360.00                        | 0.08037           |
| RUN UP-LEAN |                 | 4            | -0.0          | 30.50                          | 346.00                        | 0.07989           |
| RUN UP-RICH |                 | 5            | -0.0          | 30.50                          | 349.00                        | 0.08025           |
| TAKE-OFF    |                 | 6            | -0.0          | 71.50                          | 779.00                        | 0.08610           |
| CLIMB       |                 | 7            | -0.0          | 71.50                          | 779.00                        | 0.08610           |
| DESCENT     |                 | 8            | -0.0          | 46.90                          | 523.00                        | 0.08177           |
| DESCENT     | ON              | 9            | -0.0          | 44.50                          | 517.00                        | 0.07909           |
| APPROACH    |                 | 10           | -0.0          | 17.60                          | 194.00                        | 0.08378           |
| TAXI        |                 | 10           | -0.0          | 11.70                          | 155.00                        | 0.04185           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 269.00                              | -0.00                              | 1.40                     | 5.00                          | 906.00               | 16.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | 392.00                              | -0.00                              | 3.10                     | 7.30                          | 1180.00              | 40.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 897.00                              | -0.00                              | 8.90                     | 8.20                          | 2608.00              | 137.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 785.00                              | -0.00                              | 8.90                     | 8.10                          | 2498.00              | 88.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 975.00                              | -0.00                              | 8.80                     | 8.30                          | 2443.00              | 96.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1256.00                             | -0.00                              | 10.60                    | 7.70                          | 2443.00              | 98.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1256.00                             | -0.00                              | 10.60                    | 7.70                          | 2443.00              | 98.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1166.00                             | -0.00                              | 9.60                     | 7.80                          | 2278.00              | 68.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1166.00                             | -0.00                              | 8.40                     | 8.50                          | 2114.00              | 198.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 10.00                    | 7.70                          | 3486.00              | 77.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 10           | 437.00                              | -0.00                              | 2.50                     | 6.40                          | 906.00               | 40.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 435.76                             | 16.15                              | 0.0                                 | 2445.26                             | 0.82                               | 0.82                                | 5098.36                 | 188.96                  | 0.0                      | 28609.55                 | 9.57                    | 9.57                     |
| 2            | 595.43                             | 12.98                              | 0.0                                 | 2203.08                             | 1.26                               | 1.26                                | 6966.52                 | 151.87                  | 0.0                      | 25776.00                 | 14.77                   | 14.77                    |
| 3            | 1035.67                            | 17.38                              | 0.0                                 | 1499.29                             | 2.62                               | 2.62                                | 32727.20                | 549.25                  | 0.0                      | 47377.38                 | 82.75                   | 82.75                    |
| 4            | 1042.34                            | 16.76                              | 0.0                                 | 1490.53                             | 1.69                               | 1.69                                | 31791.24                | 511.04                  | 0.0                      | 45461.20                 | 51.63                   | 51.63                    |
| 5            | 1025.01                            | 16.30                              | 0.0                                 | 1519.01                             | 1.84                               | 1.84                                | 31262.77                | 497.07                  | 0.0                      | 46329.86                 | 56.02                   | 56.02                    |
| 6            | 1154.77                            | 15.24                              | 0.0                                 | 1318.02                             | 1.75                               | 1.75                                | 82566.31                | 1089.85                 | 0.0                      | 94238.00                 | 125.38                  | 125.38                   |
| 7            | 1154.77                            | 15.24                              | 0.0                                 | 1318.02                             | 1.75                               | 1.75                                | 82566.31                | 1089.85                 | 0.0                      | 94238.00                 | 125.38                  | 125.38                   |
| 8            | 1100.21                            | 14.95                              | 0.0                                 | 1404.55                             | 1.28                               | 1.28                                | 51599.77                | 701.25                  | 0.0                      | 65873.25                 | 60.04                   | 60.04                    |
| 8            | 991.73                             | 14.29                              | 0.0                                 | 1576.79                             | 3.84                               | 3.84                                | 44132.19                | 636.10                  | 0.0                      | 70167.06                 | 170.87                  | 170.87                   |
| 9            | 1119.33                            | 22.35                              | 0.0                                 | 1354.21                             | 1.42                               | 1.42                                | 19700.20                | 393.32                  | 0.0                      | 23834.14                 | 24.92                   | 24.92                    |
| 10           | 561.76                             | 11.66                              | 0.0                                 | 2259.60                             | 1.48                               | 1.48                                | 6572.63                 | 136.42                  | 0.0                      | 26437.30                 | 17.27                   | 17.27                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 11.70                          | 2.34                 | 595.43                 | 6966.52              | 1.393                  | 12.98                  | 151.87               | 0.030                  | 1.26                   | 14.77                | 0.0030                 |
| 6                       | 0.30                    | 71.50                          | 0.36                 | 1154.77                | 82566.31             | 0.413                  | 15.24                  | 1089.85              | 0.005                  | 1.75                   | 125.38               | 0.0006                 |
| 7                       | 5.00                    | 71.50                          | 5.93                 | 1154.77                | 82566.31             | 6.853                  | 15.24                  | 1089.85              | 0.090                  | 1.75                   | 125.38               | 0.0104                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 1119.33                | 19700.20             | 1.970                  | 22.35                  | 393.32               | 0.039                  | 1.42                   | 24.92                | 0.0025                 |
| 10                      | 4.00                    | 11.70                          | 0.78                 | 561.76                 | 6572.63              | 0.440                  | 11.66                  | 136.42               | 0.009                  | 1.48                   | 17.27                | 0.0012                 |
| TOTAL FOR CYCLE         |                         |                                | 11.176               |                        |                      | 11.070                 |                        |                      | 0.175                  |                        |                      | 0.0176                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.990                  |                        |                      | 0.016                  |                        |                      | 0.0016                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 251 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-16344-27AB  
 RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 720. HRS

FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.85

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 14.10                          | 195.00                        | 0.02678           |
| IDLE/TAXI   |                 | 2            | -0.0          | 16.40                          | 224.00                        | 0.03949           |
| RUN UP      |                 | 3            | -0.0          | 35.20                          | 399.00                        | 0.07076           |
| RUN UP-LEAN |                 | 4            | -0.0          | 34.00                          | 387.00                        | 0.07075           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.00                          | 386.00                        | 0.07068           |
| TAKE-OFF    |                 | 6            | -0.0          | 71.50                          | 812.00                        | 0.07480           |
| CLIMB       |                 | 7            | -0.0          | 71.50                          | 812.00                        | 0.07480           |
| DESCENT     |                 | 8            | -0.0          | 45.70                          | 486.00                        | 0.04882           |
| DESCENT     | ON              | 8            | -0.0          | 50.40                          | 548.00                        | 0.07571           |
| APPROACH    |                 | 9            | -0.0          | 23.40                          | 265.00                        | 0.07176           |
| TAXI        |                 | 10           | -0.0          | 16.40                          | 226.00                        | 0.03669           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 303.00                              | -0.00                              | 1.00                     | 4.60                          | 1104.00              | 36.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 2            | 437.00                              | -0.00                              | 1.80                     | 6.60                          | 938.00               | 71.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 3            | 1043.00                             | -0.00                              | 7.90                     | 7.10                          | 2152.00              | 143.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1009.00                             | -0.00                              | 7.80                     | 7.20                          | 2207.00              | 127.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1087.00                             | -0.00                              | 7.90                     | 7.10                          | 1986.00              | 97.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1323.00                             | -0.00                              | 8.40                     | 7.50                          | 2097.00              | 118.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1323.00                             | -0.00                              | 8.40                     | 7.50                          | 2097.00              | 118.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | 1256.00                             | -0.00                              | 6.10                     | 4.10                          | 1655.00              | 295.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | 1199.00                             | -0.00                              | 9.30                     | 6.70                          | 2428.00              | 102.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 9            | 953.00                              | -0.00                              | 8.00                     | 7.20                          | 2373.00              | 110.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 471.00                              | -0.00                              | 1.60                     | 6.20                          | 772.00               | 98.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 353.78                             | 22.37                              | 0.0                                 | 2557.00                             | 2.09                               | 2.09                                | 4988.32                 | 315.41                  | 0.0                      | 36053.75                 | 29.50                   | 29.50                    |
| 2            | 428.13                             | 12.78                              | 0.0                                 | 2466.51                             | 2.77                               | 2.77                                | 7021.27                 | 209.55                  | 0.0                      | 40450.65                 | 45.49                   | 45.49                    |
| 3            | 1048.94                            | 16.36                              | 0.0                                 | 1481.22                             | 3.12                               | 3.12                                | 36922.73                | 576.04                  | 0.0                      | 52139.05                 | 109.78                  | 109.78                   |
| 4            | 1035.29                            | 16.78                              | 0.0                                 | 1501.54                             | 2.77                               | 2.77                                | 35199.84                | 570.42                  | 0.0                      | 51052.49                 | 94.14                   | 94.14                    |
| 5            | 1050.09                            | 15.12                              | 0.0                                 | 1482.84                             | 2.12                               | 2.12                                | 35702.96                | 514.05                  | 0.0                      | 50416.59                 | 72.01                   | 72.01                    |
| 6            | 1053.40                            | 15.06                              | 0.0                                 | 1477.79                             | 2.43                               | 2.43                                | 75318.06                | 1076.87                 | 0.0                      | 105662.19                | 173.79                  | 173.79                   |
| 7            | 1053.40                            | 15.06                              | 0.0                                 | 1477.79                             | 2.43                               | 2.43                                | 75318.06                | 1076.87                 | 0.0                      | 105662.19                | 173.79                  | 173.79                   |
| 8            | 1188.89                            | 18.47                              | 0.0                                 | 1255.55                             | 9.44                               | 9.44                                | 54332.23                | 844.25                  | 0.0                      | 57378.58                 | 431.59                  | 431.59                   |
| 8            | 1156.71                            | 17.30                              | 0.0                                 | 1309.34                             | 2.08                               | 2.08                                | 58298.11                | 871.70                  | 0.0                      | 65990.94                 | 105.02                  | 105.02                   |
| 9            | 1046.94                            | 17.79                              | 0.0                                 | 1480.48                             | 2.36                               | 2.36                                | 24498.32                | 416.19                  | 0.0                      | 34643.13                 | 55.33                   | 55.33                    |
| 10           | 410.35                             | 11.34                              | 0.0                                 | 2498.39                             | 4.13                               | 4.13                                | 6729.66                 | 185.97                  | 0.0                      | 40973.55                 | 67.70                   | 67.70                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 16.40                          | 3.28                 | 428.13                 | 7021.27              | 1.404                  | 12.78                  | 209.55               | 0.042                  | 2.77                   | 45.49                | 0.0091                 |
| 6                       | 0.30                    | 71.50                          | 0.36                 | 1053.40                | 75318.06             | 0.377                  | 15.06                  | 1076.87              | 0.005                  | 2.43                   | 173.79               | 0.0009                 |
| 7                       | 5.00                    | 71.50                          | 5.93                 | 1053.40                | 75318.06             | 6.251                  | 15.06                  | 1076.87              | 0.089                  | 2.43                   | 173.79               | 0.0144                 |
| 9                       | 6.00                    | 23.40                          | 2.34                 | 1046.94                | 24498.32             | 2.450                  | 17.79                  | 416.19               | 0.042                  | 2.36                   | 55.33                | 0.0055                 |
| 10                      | 4.00                    | 16.40                          | 1.10                 | 410.35                 | 6729.66              | 0.451                  | 11.34                  | 185.97               | 0.012                  | 4.13                   | 67.70                | 0.0045                 |
| TOTAL FOR CYCLE         |                         |                                | 13.011               |                        |                      | 10.933                 |                        |                      | 0.191                  |                        |                      | 0.0345                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.840                  |                        |                      | 0.015                  |                        |                      | 0.0026                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 252 ENGINE TYPE AND MODEL: D-320-E2A

SERIAL NUMBER: L-16344-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 720. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.85

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 57.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 14.10                          | 189.00                        | 0.02767           |
| IDLE/TAXI   |                 | 2            | -0.0          | 14.10                          | 186.00                        | 0.04018           |
| RUN UP      |                 | 3            | -0.0          | 34.00                          | 383.00                        | 0.06901           |
| RUN UP-LEAN |                 | 4            | -0.0          | 32.80                          | 373.00                        | 0.06889           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.00                          | 383.00                        | 0.07027           |
| TAKE-OFF    |                 | 6            | -0.0          | 69.10                          | 790.00                        | 0.07372           |
| CLIMB       |                 | 7            | -0.0          | 69.10                          | 790.00                        | 0.07372           |
| DESCENT     |                 | 8            | -0.0          | 41.00                          | 500.00                        | 0.06863           |
| DESCENT     | ON              | 8            | -0.0          | 44.50                          | 517.00                        | 0.07097           |
| APPROACH    |                 | 9            | -0.0          | 22.30                          | 254.00                        | 0.07033           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 191.00                        | 0.03772           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 280.00                              | -0.00                              | 1.40                     | 4.40                          | 933.00               | 23.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 2.40                     | 6.10                          | 1208.00              | 46.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 3            | 998.00                              | -0.00                              | 7.80                     | 6.80                          | 2196.00              | 119.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 942.00                              | -0.00                              | 7.60                     | 7.00                          | 2086.00              | 92.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1054.00                             | -0.00                              | 8.00                     | 6.90                          | 1976.00              | 81.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1323.00                             | -0.00                              | 8.10                     | 7.60                          | 1867.00              | 110.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1323.00                             | -0.00                              | 8.10                     | 7.60                          | 1867.00              | 110.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 6.20                     | 8.50                          | 1592.00              | 196.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | 1199.00                             | -0.00                              | 7.50                     | 7.60                          | 1976.00              | 305.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 7.70                     | 7.20                          | 2306.00              | 111.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 1.80                     | 6.20                          | 988.00               | 102.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 479.92                             | 18.32                              | 0.0                                 | 2369.92                             | 1.30                               | 1.30                                | 6766.91                 | 258.28                  | 0.0                      | 33415.92                 | 18.26                   | 18.26                    |
| 2            | 562.43                             | 16.21                              | 0.0                                 | 2246.07                             | 1.77                               | 1.77                                | 7930.21                 | 228.60                  | 0.0                      | 31669.52                 | 24.97                   | 24.97                    |
| 3            | 1063.31                            | 17.15                              | 0.0                                 | 1456.51                             | 2.66                               | 2.66                                | 36152.54                | 582.94                  | 0.0                      | 49521.21                 | 90.60                   | 90.60                    |
| 4            | 1036.82                            | 16.30                              | 0.0                                 | 1500.46                             | 2.06                               | 2.06                                | 34007.54                | 534.59                  | 0.0                      | 49215.02                 | 67.62                   | 67.62                    |
| 5            | 1070.49                            | 15.14                              | 0.0                                 | 1450.71                             | 1.78                               | 1.78                                | 36396.76                | 514.88                  | 0.0                      | 49324.72                 | 60.53                   | 60.53                    |
| 6            | 1030.04                            | 13.60                              | 0.0                                 | 1518.52                             | 2.30                               | 2.30                                | 71175.56                | 939.58                  | 0.0                      | 104929.50                | 158.77                  | 158.77                   |
| 7            | 1030.04                            | 13.60                              | 0.0                                 | 1518.52                             | 2.30                               | 2.30                                | 71175.56                | 939.58                  | 0.0                      | 104929.50                | 158.77                  | 158.77                   |
| 8            | 842.94                             | 12.40                              | 0.0                                 | 1815.78                             | 4.38                               | 4.38                                | 34560.65                | 508.25                  | 0.0                      | 74447.00                 | 179.46                  | 179.46                   |
| 8            | 990.47                             | 14.95                              | 0.0                                 | 1576.99                             | 6.62                               | 6.62                                | 44075.76                | 665.08                  | 0.0                      | 70176.25                 | 294.41                  | 294.41                   |
| 9            | 1028.10                            | 17.63                              | 0.0                                 | 1510.48                             | 2.43                               | 2.43                                | 22926.66                | 393.24                  | 0.0                      | 33683.77                 | 54.29                   | 54.29                    |
| 10           | 449.01                             | 14.12                              | 0.0                                 | 2430.03                             | 4.18                               | 4.18                                | 6331.00                 | 199.02                  | 0.0                      | 34263.38                 | 58.93                   | 58.93                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 14.10                          | 2.82                 | 562.43                 | 7930.21              | 1.586                  | 16.21                  | 228.60               | 0.046                  | 1.77                   | 24.97                | 0.0050                 |
| 6                       | 0.30                    | 69.10                          | 0.15                 | 1030.04                | 71175.56             | 0.356                  | 13.60                  | 939.58               | 0.005                  | 2.30                   | 158.77               | 0.0008                 |
| 7                       | 5.00                    | 69.10                          | 5.74                 | 1030.04                | 71175.56             | 5.908                  | 13.60                  | 939.58               | 0.078                  | 2.30                   | 158.77               | 0.0132                 |
| 9                       | 6.00                    | 22.30                          | 2.23                 | 1028.10                | 22926.66             | 2.293                  | 17.63                  | 393.24               | 0.039                  | 2.43                   | 54.29                | 0.0054                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 449.01                 | 6331.00              | 0.424                  | 14.12                  | 199.02               | 0.013                  | 4.18                   | 58.93                | 0.0039                 |
| TOTAL FOR CYCLE         |                         |                                | 12.075               |                        |                      | 10.566                 |                        |                      | 0.181                  |                        |                      | 0.0283                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.875                  |                        |                      | 0.015                  |                        |                      | 0.0023                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCONING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 260 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-29302-27AB

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 130. HRS

FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 45.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 7.00                           | 87.00                         | 0.05453           |
| IDLE/TAXI   |                 | 2            | -0.0          | 5.30                           | 63.00                         | 0.06875           |
| RUN UP      |                 | 3            | -0.0          | 15.80                          | 182.00                        | 0.07399           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.80                          | 183.00                        | 0.07344           |
| RUN UP-RICH |                 | 5            | -0.0          | 15.80                          | 183.00                        | 0.07334           |
| TAKE-OFF    |                 | 6            | -0.0          | 38.70                          | 436.00                        | 0.07891           |
| CLIMB       |                 | 7            | -0.0          | 38.70                          | 436.00                        | 0.07891           |
| DESCENT     |                 | 8            | -0.0          | 22.90                          | 274.00                        | 0.07295           |
| DESCENT     | ON              | 8            | -0.0          | 22.90                          | 279.00                        | 0.07187           |
| APPROACH    |                 | 9            | -0.0          | 15.80                          | 178.00                        | 0.07429           |
| TAXI        |                 | 10           | -0.0          | 5.30                           | 66.00                         | 0.06204           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 791.00                              | -0.00                              | 4.40                     | 7.10                          | 2425.00              | 30.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 6.40                     | 8.20                          | 2647.00              | 51.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 1020.00                             | -0.00                              | 8.00                     | 7.70                          | 2536.00              | 109.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 985.00                              | -0.00                              | 7.80                     | 7.80                          | 2425.00              | 96.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1076.00                             | -0.00                              | 7.80                     | 7.80                          | 2202.00              | 73.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1300.00                             | -0.00                              | 9.00                     | 7.80                          | 2146.00              | 8.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1300.00                             | -0.00                              | 9.00                     | 7.80                          | 2146.00              | 8.00                | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1222.00                             | -0.00                              | 7.00                     | 8.60                          | 1979.00              | 34.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1188.00                             | -0.00                              | 6.50                     | 8.90                          | 1867.00              | 109.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 8.40                     | 7.30                          | 2870.00              | 65.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 5.10                     | 8.10                          | 2146.00              | 62.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 757.00                             | 23.09                              | 0.0                                 | 1919.28                             | 0.85                               | 0.85                                | 5298.97                 | 167.26                  | 0.0                      | 13434.95                 | 5.93                    | 5.93                     |
| 2            | 869.81                             | 20.60                              | 0.0                                 | 1751.05                             | 1.14                               | 1.14                                | 4610.00                 | 109.20                  | 0.0                      | 9280.54                  | 6.03                    | 6.03                     |
| 3            | 1013.05                            | 18.39                              | 0.0                                 | 1532.05                             | 2.27                               | 2.27                                | 16006.27                | 290.60                  | 0.0                      | 24206.34                 | 35.82                   | 35.82                    |
| 4            | 994.66                             | 17.71                              | 0.0                                 | 1562.83                             | 2.01                               | 2.01                                | 15715.56                | 279.83                  | 0.0                      | 24692.66                 | 31.77                   | 31.77                    |
| 5            | 996.06                             | 16.10                              | 0.0                                 | 1565.03                             | 1.53                               | 1.53                                | 15737.71                | 254.45                  | 0.0                      | 24727.46                 | 24.19                   | 24.19                    |
| 6            | 1068.62                            | 14.59                              | 0.0                                 | 1455.17                             | 0.16                               | 0.16                                | 41355.53                | 564.76                  | 0.0                      | 56314.95                 | 6.04                    | 6.04                     |
| 7            | 1068.62                            | 14.59                              | 0.0                                 | 1455.17                             | 0.16                               | 0.16                                | 41355.53                | 564.76                  | 0.0                      | 56314.95                 | 6.04                    | 6.04                     |
| 8            | 895.16                             | 14.49                              | 0.0                                 | 1727.98                             | 0.71                               | 0.71                                | 20499.14                | 331.92                  | 0.0                      | 39570.77                 | 16.35                   | 16.35                    |
| 8            | 842.48                             | 13.86                              | 0.0                                 | 1812.49                             | 2.32                               | 2.32                                | 19292.84                | 317.38                  | 0.0                      | 41506.02                 | 53.14                   | 53.14                    |
| 9            | 1051.49                            | 20.77                              | 0.0                                 | 1449.43                             | 1.35                               | 1.35                                | 16771.47                | 328.19                  | 0.0                      | 22900.91                 | 21.32                   | 21.32                    |
| 10           | 748.06                             | 18.51                              | 0.0                                 | 1916.67                             | 1.53                               | 1.53                                | 4070.71                 | 98.10                   | 0.0                      | 10158.34                 | 8.13                    | 8.13                     |

#### LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 5.30                           | 1.06                 | 869.81                 | 4610.00              | 0.922                  | 20.60                  | 109.20               | 0.022                  | 1.14                   | 6.03                 | 0.0012                 |
| 6                       | 0.30                    | 38.70                          | 0.19                 | 1068.62                | 41355.53             | 0.207                  | 14.59                  | 564.76               | 0.003                  | 0.16                   | 6.04                 | 0.0000                 |
| 7                       | 5.00                    | 38.70                          | 3.21                 | 1068.62                | 41355.53             | 3.433                  | 14.59                  | 564.76               | 0.047                  | 0.16                   | 6.04                 | 0.0005                 |
| 9                       | 6.00                    | 15.80                          | 1.58                 | 1061.49                | 16771.47             | 1.677                  | 20.77                  | 328.19               | 0.033                  | 1.35                   | 21.32                | 0.0021                 |
| 10                      | 4.00                    | 5.30                           | 0.36                 | 748.06                 | 4070.71              | 0.273                  | 18.51                  | 98.10                | 0.007                  | 1.53                   | 8.13                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 6.401                |                        |                      | 6.511                  |                        |                      | 0.111                  |                        |                      | 0.0044                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.017                  |                        |                      | 0.017                  |                        |                      | 0.0007                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 261 ENGINE TYPE AND MODEL: D-320-E2A

SERIAL NUMBER: L-29302-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 130. MRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 1.00                           | 81.00                         | 0.05272           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.00                           | 83.00                         | 0.06977           |
| RUN UP      |                 | 3            | -0.0          | 15.80                          | 182.00                        | 0.06718           |
| RUN UP-LEAN |                 | 4            | -0.0          | 15.80                          | 183.00                        | 0.07472           |
| RUN UP-RICH |                 | 5            | -0.0          | 15.80                          | 182.00                        | 0.06655           |
| TAKE-OFF    |                 | 6            | -0.0          | 38.70                          | 435.00                        | 0.07031           |
| CLIMB       |                 | 7            | -0.0          | 38.70                          | 435.00                        | 0.07031           |
| DESCENT     |                 | 8            | -0.0          | 21.10                          | 253.00                        | 0.06529           |
| DESCENT     | ON              | 8            | -0.0          | 24.60                          | 284.00                        | 0.06699           |
| APPROACH    |                 | 9            | -0.0          | 14.10                          | 157.00                        | 0.06755           |
| TAXI        |                 | 10           | -0.0          | 5.30                           | 66.00                         | 0.05838           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-----------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 4.40                   | 6.70                        | 2317.00              | 27.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 2            | 448.00                              | -0.00                              | 6.80                   | 8.00                        | 2704.00              | 47.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 1043.00                             | -0.00                              | 7.20                   | 7.00                        | 2428.00              | 98.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1009.00                             | -0.00                              | 7.90                   | 8.00                        | 2317.00              | 80.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1065.00                             | -0.00                              | 7.10                   | 7.00                        | 2097.00              | 67.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1289.00                             | -0.00                              | 8.00                   | 6.90                        | 2042.00              | 8.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1289.00                             | -0.00                              | 8.00                   | 6.90                        | 2042.00              | 8.00                | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 6.20                   | 7.70                        | 1876.00              | 34.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1188.00                             | -0.00                              | 7.10                   | 7.10                        | 2097.00              | 67.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | 947.00                              | -0.00                              | 7.70                   | 6.50                        | 2869.00              | 48.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 4.60                   | 7.80                        | 2097.00              | 66.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 784.44                             | 23.66                              | 0.0                                 | 1876.81                             | 0.79                               | 0.79                                | 5491.07                 | 165.61                  | 0.0                      | 13137.65                 | 5.53                    | 5.53                     |
| 2            | 911.56                             | 20.76                              | 0.0                                 | 1685.02                             | 1.03                               | 1.03                                | 6380.93                 | 145.32                  | 0.0                      | 11795.14                 | 7.24                    | 7.24                     |
| 3            | 1007.12                            | 19.45                              | 0.0                                 | 1538.46                             | 2.25                               | 2.25                                | 15912.56                | 307.33                  | 0.0                      | 24307.69                 | 35.58                   | 35.58                    |
| 4            | 989.35                             | 16.62                              | 0.0                                 | 1574.16                             | 1.65                               | 1.65                                | 15631.69                | 262.57                  | 0.0                      | 24871.78                 | 26.00                   | 26.00                    |
| 5            | 1002.37                            | 16.96                              | 0.0                                 | 1552.77                             | 1.55                               | 1.55                                | 15837.50                | 267.90                  | 0.0                      | 24533.78                 | 24.55                   | 24.55                    |
| 6            | 1070.03                            | 15.64                              | 0.0                                 | 1450.08                             | 0.18                               | 0.18                                | 41409.97                | 605.36                  | 0.0                      | 56118.02                 | 6.80                    | 6.80                     |
| 7            | 1070.03                            | 15.64                              | 0.0                                 | 1450.08                             | 0.18                               | 0.18                                | 41409.97                | 605.36                  | 0.0                      | 56118.02                 | 6.80                    | 6.80                     |
| 8            | 889.11                             | 15.41                              | 0.0                                 | 1734.98                             | 0.80                               | 0.80                                | 18760.25                | 325.11                  | 0.0                      | 36607.98                 | 16.90                   | 16.90                    |
| 8            | 995.42                             | 16.84                              | 0.0                                 | 1564.03                             | 1.54                               | 1.54                                | 24487.26                | 414.21                  | 0.0                      | 38474.99                 | 37.96                   | 37.96                    |
| 9            | 1073.78                            | 22.91                              | 0.0                                 | 1424.22                             | 1.10                               | 1.10                                | 15140.36                | 323.09                  | 0.0                      | 20081.54                 | 15.50                   | 15.50                    |
| 10           | 736.98                             | 19.24                              | 0.0                                 | 1963.50                             | 1.74                               | 1.74                                | 3905.98                 | 101.98                  | 0.0                      | 10406.52                 | 9.21                    | 9.21                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.00                           | 1.40                 | 911.56                 | 6380.93              | 1.276                  | 20.76                  | 145.32               | 0.029                  | 1.03                   | 7.24                 | 0.0014                 |
| 6                       | 0.30                    | 38.70                          | 0.19                 | 1070.03                | 41409.97             | 0.207                  | 15.64                  | 605.36               | 0.003                  | 0.18                   | 6.80                 | 0.0000                 |
| 7                       | 5.00                    | 38.70                          | 3.21                 | 1070.03                | 41409.97             | 3.437                  | 15.64                  | 605.36               | 0.050                  | 0.18                   | 6.80                 | 0.0006                 |
| 9                       | 6.00                    | 14.10                          | 1.41                 | 1073.78                | 15140.36             | 1.514                  | 22.91                  | 323.09               | 0.032                  | 1.10                   | 15.50                | 0.0016                 |
| 10                      | 4.00                    | 5.30                           | 0.36                 | 736.98                 | 3905.98              | 0.262                  | 19.24                  | 101.98               | 0.007                  | 1.74                   | 9.21                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 6.571                |                        |                      | 6.696                  |                        |                      | 0.121                  |                        |                      | 0.0042                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.019                  |                        |                      | 0.018                  |                        |                      | 0.0006                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEM AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 160 ENGINE TYPE AND MODEL: O-320-E2D SERIAL NUMBER: L-23495-27AA

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 527. MRS

FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.09 FINISH 30.09

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 68.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.60                           | 69.00                         | 0.06636           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.10                           | 100.00                        | 0.06508           |
| RUN UP      |                 | 3            | -0.0          | 26.40                          | 320.00                        | 0.07119           |
| RUN UP-LEAN |                 | 4            | -0.0          | 23.70                          | 294.00                        | 0.06432           |
| RUN UP-RICH |                 | 5            | -0.0          | 24.60                          | 306.00                        | 0.06914           |
| TAKE-OFF    |                 | 6            | -0.0          | 51.50                          | 613.00                        | 0.07287           |
| CLIMB       |                 | 7            | -0.0          | 51.50                          | -0.00                         | 0.07545           |
| DESCENT     |                 | 8            | -0.0          | 35.50                          | 453.00                        | 0.07080           |
| DESCENT     | ON              | 9            | -0.0          | 35.50                          | 420.00                        | 0.07340           |
| APPROACH    |                 | 9            | -0.0          | 14.10                          | 174.00                        | 0.06850           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 88.00                         | 0.05318           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 560.00                              | -0.00                              | 5.30                     | 8.70                          | 3860.00              | 29.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 5.50                     | 8.30                          | 2835.00              | 45.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 1009.00                             | -0.00                              | 6.30                     | 8.90                          | 2412.00              | 268.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 953.00                              | -0.00                              | 5.50                     | 8.20                          | 2111.00              | 162.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1043.00                             | -0.00                              | 5.90                     | 8.90                          | 1990.00              | 163.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1334.00                             | -0.00                              | 7.50                     | 8.00                          | 2352.00              | 173.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1334.00                             | -0.00                              | 7.50                     | 8.60                          | 2352.00              | 173.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1256.00                             | -0.00                              | 5.40                     | 9.80                          | 2232.00              | 465.00              | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |
| 9            | 1222.00                             | -0.00                              | 7.30                     | 8.30                          | 2714.00              | 268.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | 964.00                              | -0.00                              | 5.90                     | 8.70                          | 2473.00              | 163.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 650.00                              | -0.00                              | 2.30                     | 9.10                          | 1628.00              | 85.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 744.28                             | 31.05                              | 0.0                                 | 1919.64                             | 0.67                               | 0.67                                | 4167.98                 | 173.85                  | 0.0                      | 10749.96                 | 3.75                    | 3.75                     |
| 2            | 788.96                             | 23.29                              | 0.0                                 | 1870.71                             | 1.06                               | 1.06                                | 6390.56                 | 188.66                  | 0.0                      | 15152.79                 | 8.59                    | 8.59                     |
| 3            | 824.25                             | 18.07                              | 0.0                                 | 1829.57                             | 5.76                               | 5.76                                | 21760.31                | 477.14                  | 0.0                      | 48300.66                 | 152.05                  | 152.05                   |
| 4            | 798.74                             | 17.56                              | 0.0                                 | 1871.08                             | 3.86                               | 3.86                                | 18930.02                | 416.12                  | 0.0                      | 44344.59                 | 91.58                   | 91.58                    |
| 5            | 794.68                             | 15.35                              | 0.0                                 | 1883.51                             | 3.61                               | 3.61                                | 19549.07                | 377.64                  | 0.0                      | 46334.32                 | 88.71                   | 88.71                    |
| 6            | 962.92                             | 17.29                              | 0.0                                 | 1613.83                             | 3.65                               | 3.65                                | 49590.45                | 890.67                  | 0.0                      | 83112.19                 | 187.89                  | 187.89                   |
| 7            | 927.55                             | 16.66                              | 0.0                                 | 1671.14                             | 3.51                               | 3.51                                | 47768.96                | 857.96                  | 0.0                      | 86063.94                 | 180.99                  | 180.99                   |
| 8            | 707.33                             | 16.74                              | 0.0                                 | 2016.93                             | 10.00                              | 10.00                               | 25110.15                | 594.42                  | 0.0                      | 71601.13                 | 355.16                  | 355.16                   |
| 8            | 929.20                             | 19.79                              | 0.0                                 | 1659.98                             | 5.60                               | 5.60                                | 32986.62                | 702.38                  | 0.0                      | 58929.30                 | 198.92                  | 198.92                   |
| 9            | 802.80                             | 19.27                              | 0.0                                 | 1860.00                             | 3.64                               | 3.64                                | 11319.45                | 271.73                  | 0.0                      | 26225.92                 | 51.37                   | 51.37                    |
| 10           | 401.85                             | 16.29                              | 0.0                                 | 2498.15                             | 2.44                               | 2.44                                | 2571.85                 | 104.26                  | 0.0                      | 15988.15                 | 15.61                   | 15.61                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/LK<br>LB FUEL | CO<br>LB/LK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/LK<br>LB FUEL | HC<br>LB/LK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/LK<br>LB FUEL | NO<br>LB/LK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.10                           | 1.62                 | 788.96                 | 6390.56              | 1.278                  | 23.29                  | 188.66               | 0.038                  | 1.06                   | 8.59                 | 0.0017                 |
| 6                       | 0.30                    | 51.50                          | 0.26                 | 962.92                 | 49590.45             | 0.248                  | 17.29                  | 890.67               | 0.004                  | 3.65                   | 187.89               | 0.0009                 |
| 7                       | 5.00                    | 51.50                          | 4.27                 | 927.55                 | 47768.96             | 3.965                  | 16.66                  | 857.96               | 0.071                  | 3.51                   | 180.99               | 0.0150                 |
| 9                       | 6.00                    | 14.10                          | 1.41                 | 802.80                 | 11319.45             | 1.132                  | 19.27                  | 271.73               | 0.027                  | 3.64                   | 51.37                | 0.0051                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 401.85                 | 2571.85              | 0.172                  | 16.29                  | 104.26               | 0.007                  | 2.44                   | 15.61                | 0.0010                 |
| TOTAL FOR CYCLE         |                         |                                | 7.991                |                        |                      | 6.795                  |                        |                      | 0.148                  |                        |                      | 0.0239                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.850                  |                        |                      | 0.018                  |                        |                      | 0.0030                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 161 ENGINE TYPE AND MODEL: O-320-E2D

SERIAL NUMBER: L-23495-27AB

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 527. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.50 FINISH 85.50

ATMOSPHERIC PRESSURE: START 30.10 FINISH 30.10

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 65.00                         | 0.05011           |
| IDLE/TAXI   |                 | 2            | -0.0          | 6.40                           | 86.00                         | 0.05939           |
| RUN UP      |                 | 3            | -0.0          | 24.60                          | 305.00                        | 0.07116           |
| RUN UP-LEAN |                 | 4            | -0.0          | 22.00                          | 276.00                        | 0.06857           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.00                          | 272.00                        | 0.07149           |
| TAKE-OFF    |                 | 6            | -0.0          | 53.50                          | 720.00                        | 0.07218           |
| CLIMB       |                 | 7            | -0.0          | 53.50                          | 720.00                        | 0.07218           |
| DESCENT     |                 | 8            | -0.0          | 39.20                          | 500.00                        | 0.07296           |
| DESCENT     | ON              | 8            | -0.0          | 34.60                          | 404.00                        | 0.07755           |
| APPROACH    |                 | 9            | -0.0          | 15.80                          | 197.00                        | 0.07153           |
| TAXI        |                 | 10           | -0.0          | 4.70                           | 65.00                         | 0.05420           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 516.00                              | -0.00                              | 1.70                     | 8.70                          | 4795.00              | 46.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 1.30                     | 9.40                          | 2262.00              | 70.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 3            | 998.00                              | -0.00                              | 6.10                     | 9.10                          | 2503.00              | 280.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 942.00                              | -0.00                              | 5.60                     | 9.10                          | 1900.00              | 143.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1054.00                             | -0.00                              | 6.20                     | 9.10                          | 2201.00              | 160.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 4.20                     | 11.50                         | 1478.00              | 971.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 4.20                     | 11.50                         | 1478.00              | 971.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1199.00                             | -0.00                              | 5.60                     | 10.10                         | 2141.00              | 478.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 8.00                     | 8.50                          | 2804.00              | 253.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 930.00                              | -0.00                              | 6.00                     | 9.30                          | 2443.00              | 168.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 605.00                              | -0.00                              | 2.30                     | 9.30                          | 1960.00              | 78.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 315.68                             | 50.99                              | 0.0                                 | 2538.34                             | 1.40                               | 1.40                                | 1483.68                 | 239.68                  | 0.0                      | 11930.21                 | 6.59                    | 6.59                     |
| 2            | 515.76                             | 20.25                              | 0.0                                 | 2308.33                             | 1.80                               | 1.80                                | 3300.84                 | 129.58                  | 0.0                      | 14773.27                 | 11.50                   | 11.50                    |
| 3            | 797.62                             | 18.74                              | 0.0                                 | 1869.58                             | 6.01                               | 6.01                                | 19621.38                | 461.11                  | 0.0                      | 45991.67                 | 147.94                  | 147.94                   |
| 4            | 759.79                             | 14.76                              | 0.0                                 | 1939.93                             | 3.19                               | 3.19                                | 16715.44                | 324.81                  | 0.0                      | 42678.54                 | 70.11                   | 70.11                    |
| 5            | 807.05                             | 16.41                              | 0.0                                 | 1861.17                             | 3.42                               | 3.42                                | 17755.04                | 360.99                  | 0.0                      | 40945.83                 | 75.26                   | 75.26                    |
| 6            | 535.40                             | 10.79                              | 0.0                                 | 2303.40                             | 20.33                              | 20.33                               | 28644.13                | 577.31                  | 0.0                      | 123231.75                | 1087.74                 | 1087.74                  |
| 7            | 535.40                             | 10.79                              | 0.0                                 | 2303.40                             | 20.33                              | 20.33                               | 28644.13                | 577.31                  | 0.0                      | 123231.75                | 1087.74                 | 1087.74                  |
| 8            | 710.90                             | 15.57                              | 0.0                                 | 2014.56                             | 9.97                               | 9.97                                | 27867.23                | 610.19                  | 0.0                      | 78970.63                 | 390.71                  | 390.71                   |
| 8            | 963.14                             | 19.33                              | 0.0                                 | 1607.89                             | 5.00                               | 5.00                                | 33324.64                | 668.96                  | 0.0                      | 55633.01                 | 173.11                  | 173.11                   |
| 9            | 779.80                             | 18.18                              | 0.0                                 | 1899.12                             | 3.59                               | 3.59                                | 12320.80                | 287.31                  | 0.0                      | 30006.05                 | 56.67                   | 56.67                    |
| 10           | 393.91                             | 19.23                              | 0.0                                 | 2502.58                             | 2.19                               | 2.19                                | 1851.37                 | 90.36                   | 0.0                      | 11762.13                 | 10.31                   | 10.31                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 6.40                           | 1.28                 | 515.76                 | 3300.84              | 0.660                  | 20.25                  | 129.58               | 0.026                  | 1.80                   | 11.50                | 0.0023                 |
| 6                       | 0.30                    | 53.50                          | 0.27                 | 535.40                 | 28644.13             | 0.143                  | 10.79                  | 577.31               | 0.003                  | 20.33                  | 1087.74              | 0.0054                 |
| 7                       | 5.00                    | 53.50                          | 4.44                 | 535.40                 | 28644.13             | 2.377                  | 10.79                  | 577.31               | 0.048                  | 20.33                  | 1087.74              | 0.0903                 |
| 9                       | 6.00                    | 15.80                          | 1.58                 | 779.80                 | 12320.80             | 1.232                  | 18.18                  | 287.31               | 0.029                  | 3.59                   | 56.67                | 0.0057                 |
| 10                      | 4.00                    | 4.70                           | 0.31                 | 393.91                 | 1851.37              | 0.124                  | 19.23                  | 90.36                | 0.006                  | 2.19                   | 10.31                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                | 7.883                |                        |                      | 4.537                  |                        |                      | 0.112                  |                        |                      | 0.1044                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.576                  |                        |                      | 0.014                  |                        |                      | 0.0132                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 162 ENGINE TYPE AND MODEL: O-320-E20

SERIAL NUMBER: L-23495-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 5273. MMS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 30.10 FINISH 30.10

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 6.40                           | 84.00                         | 0.05117           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.90                           | 109.00                        | 0.06463           |
| RUN UP      |                 | 3            | -0.0          | 26.40                          | 322.00                        | 0.07262           |
| RUN UP-LEAN |                 | 4            | -0.0          | 26.40                          | 322.00                        | 0.06532           |
| RUN UP-RICH |                 | 5            | -0.0          | 26.40                          | 325.00                        | 0.06972           |
| TAKE-OFF    |                 | 6            | -0.0          | 66.30                          | 742.00                        | 0.08012           |
| CLIMB       |                 | 7            | -0.0          | 68.30                          | 765.00                        | 0.08010           |
| DESCENT     |                 | 8            | -0.0          | 32.80                          | 413.00                        | 0.07226           |
| DESCENT     | ON              | 9            | -0.0          | 35.50                          | 416.00                        | 0.07578           |
| APPROACH    |                 | 9            | -0.0          | 15.00                          | 181.00                        | 0.07273           |
| TAXI        |                 | 10           | -0.0          | 6.40                           | 88.00                         | 0.05350           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 474.00                              | -0.00                              | 3.20                     | 7.60                          | 2490.00              | 37.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 2            | 628.00                              | -0.00                              | 5.70                     | 8.00                          | 2664.00              | 56.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 1031.00                             | -0.00                              | 6.60                     | 8.90                          | 2490.00              | 218.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 897.00                              | -0.00                              | 5.90                     | 8.00                          | 2143.00              | 95.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1065.00                             | -0.00                              | 6.20                     | 8.70                          | 2085.00              | 136.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1345.00                             | -0.00                              | 9.30                     | 7.70                          | 2664.00              | 106.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1379.00                             | -0.00                              | 9.30                     | 7.70                          | 2606.00              | 73.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 5.80                     | 9.70                          | 2316.00              | 393.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 9            | 1188.00                             | -0.00                              | 7.80                     | 8.30                          | 2838.00              | 239.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 975.00                              | -0.00                              | 6.70                     | 8.80                          | 2664.00              | 116.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 617.00                              | -0.00                              | 2.30                     | 9.10                          | 2316.00              | 49.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 585.10                             | 26.07                              | 0.0                                 | 2183.39                             | 1.11                               | 1.11                                | 3744.63                 | 166.88                  | 0.0                      | 13973.66                 | 7.11                    | 7.11                     |
| 2            | 824.50                             | 22.07                              | 0.0                                 | 1818.22                             | 1.33                               | 1.33                                | 7338.07                 | 196.42                  | 0.0                      | 16182.13                 | 11.84                   | 11.84                    |
| 3            | 846.63                             | 18.29                              | 0.0                                 | 1793.81                             | 4.59                               | 4.59                                | 22350.98                | 482.94                  | 0.0                      | 47356.64                 | 121.26                  | 121.26                   |
| 4            | 844.49                             | 17.57                              | 0.0                                 | 1799.16                             | 2.23                               | 2.23                                | 22294.52                | 463.78                  | 0.0                      | 47497.89                 | 58.96                   | 58.96                    |
| 5            | 829.03                             | 15.97                              | 0.0                                 | 1827.84                             | 2.99                               | 2.99                                | 21886.47                | 421.54                  | 0.0                      | 48254.73                 | 78.86                   | 78.86                    |
| 6            | 1088.14                            | 17.85                              | 0.0                                 | 1415.56                             | 2.04                               | 2.04                                | 72143.31                | 1183.57                 | 0.0                      | 93851.69                 | 135.06                  | 135.06                   |
| 7            | 1088.50                            | 17.47                              | 0.0                                 | 1416.04                             | 1.40                               | 1.40                                | 74344.56                | 1193.12                 | 0.0                      | 96714.25                 | 95.85                   | 95.85                    |
| 8            | 744.83                             | 17.03                              | 0.0                                 | 1957.22                             | 8.29                               | 8.29                                | 24430.39                | 558.71                  | 0.0                      | 64196.71                 | 271.90                  | 271.90                   |
| 8            | 961.79                             | 20.04                              | 0.0                                 | 1608.06                             | 4.84                               | 4.84                                | 34143.66                | 711.50                  | 0.0                      | 57086.27                 | 171.84                  | 171.84                   |
| 9            | 858.51                             | 19.55                              | 0.0                                 | 1771.70                             | 2.44                               | 2.44                                | 12877.61                | 293.25                  | 0.0                      | 26575.50                 | 36.62                   | 36.62                    |
| 10           | 399.48                             | 23.04                              | 0.0                                 | 2483.37                             | 1.40                               | 1.40                                | 2556.64                 | 147.44                  | 0.0                      | 15893.58                 | 8.95                    | 8.95                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.90                           | 1.78                 | 824.50                 | 7338.07              | 1.488                  | 22.07                  | 196.42               | 0.039                  | 1.33                   | 11.84                | 0.0024                 |
| 6                       | 0.30                    | 66.30                          | 0.33                 | 1088.14                | 72143.31             | 0.361                  | 17.85                  | 1183.57              | 0.006                  | 2.04                   | 135.06               | 0.0007                 |
| 7                       | 5.00                    | 68.30                          | 5.67                 | 1088.50                | 74344.56             | 4.171                  | 17.47                  | 1193.12              | 0.099                  | 1.40                   | 95.85                | 0.0080                 |
| 9                       | 6.00                    | 15.00                          | 1.50                 | 858.51                 | 12877.61             | 1.288                  | 19.55                  | 293.25               | 0.029                  | 2.44                   | 36.62                | 0.0037                 |
| 10                      | 4.00                    | 6.40                           | 0.43                 | 399.48                 | 2556.64              | 0.171                  | 23.04                  | 147.44               | 0.010                  | 1.40                   | 8.95                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 9.709                |                        |                      | 9.458                  |                        |                      | 0.183                  |                        |                      | 0.0153                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.974                  |                        |                      | 0.019                  |                        |                      | 0.0016                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 175 ENGINE TYPE AND MODEL: D-320-E2D

SERIAL NUMBER: L-26284-27AA

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 426. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 82.50

ATMOSPHERIC PRESSURE: START 30.17 FINISH 30.17

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 73.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 6.40                           | 73.00                         | 0.07438           |
| IDLE/TAXI   |                 | 2            | -0.0          | 12.40                          | 124.00                        | 0.06961           |
| RUN UP      |                 | 3            | -0.0          | 26.40                          | 328.00                        | 0.06925           |
| RUN UP-LEAN |                 | 4            | -0.0          | 26.40                          | 327.00                        | 0.06472           |
| RUN UP-RICH |                 | 5            | -0.0          | 26.40                          | 325.00                        | 0.06958           |
| TAKE-OFF    |                 | 6            | -0.0          | 69.30                          | 785.00                        | 0.08279           |
| CLIMB       |                 | 7            | -0.0          | 69.30                          | 785.00                        | 0.08279           |
| DESCENT     |                 | 8            | -0.0          | 37.40                          | 484.00                        | 0.07387           |
| DESCENT     | ON              | 8            | -0.0          | 40.10                          | 507.00                        | 0.07591           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 214.00                        | 0.07337           |
| TAXI        |                 | 10           | -0.0          | 8.10                           | 94.00                         | 0.06928           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 460.00                              | -0.00                              | 7.50                     | 7.90                          | 6548.00              | 12.00               | -0.00                    | -0.00                    | 34.00              | -0.00 | -0.00        |
| 2            | 437.00                              | -0.00                              | 8.70                     | 5.20                          | 7372.00              | 6.00                | -0.00                    | -0.00                    | 28.00              | -0.00 | -0.00        |
| 3            | 807.00                              | -0.00                              | 5.90                     | 8.70                          | 1726.00              | 232.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 740.00                              | -0.00                              | 5.60                     | 8.20                          | 1990.00              | 120.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 863.00                              | -0.00                              | 6.20                     | 8.70                          | 1797.00              | 130.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1368.00                             | -0.00                              | 9.50                     | 8.20                          | 1797.00              | 59.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1368.00                             | -0.00                              | 9.50                     | 8.20                          | 1797.00              | 59.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1166.00                             | -0.00                              | 5.40                     | 10.60                         | 1476.00              | 588.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1166.00                             | -0.00                              | 6.20                     | 10.20                         | 1605.00              | 633.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 9            | 807.00                              | -0.00                              | 6.80                     | 8.90                          | 2118.00              | 167.00              | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 10           | 516.00                              | -0.00                              | 7.20                     | 7.40                          | 3210.00              | 37.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 943.75                             | 47.19                              | 0.0                                 | 1561.93                             | 0.25                               | 0.25                                | 6040.01                 | 302.02                  | 0.0                      | 9996.36                  | 1.59                    | 1.59                     |
| 2            | 1184.59                            | 73.08                              | 0.0                                 | 1112.48                             | 0.13                               | 0.13                                | 14688.95                | 906.25                  | 0.0                      | 13794.73                 | 1.66                    | 1.66                     |
| 3            | 805.77                             | 15.06                              | 0.0                                 | 1866.87                             | 5.20                               | 5.20                                | 21272.23                | 397.71                  | 0.0                      | 49285.43                 | 137.39                  | 137.39                   |
| 4            | 808.15                             | 16.45                              | 0.0                                 | 1859.33                             | 2.84                               | 2.84                                | 21335.19                | 434.22                  | 0.0                      | 49086.36                 | 75.09                   | 75.09                    |
| 5            | 830.62                             | 13.79                              | 0.0                                 | 1831.33                             | 2.86                               | 2.86                                | 21928.27                | 364.00                  | 0.0                      | 48347.09                 | 75.52                   | 75.52                    |
| 6            | 1073.41                            | 11.63                              | 0.0                                 | 1455.77                             | 1.09                               | 1.09                                | 74387.13                | 805.88                  | 0.0                      | 100884.94                | 75.88                   | 75.88                    |
| 7            | 1073.41                            | 11.63                              | 0.0                                 | 1455.77                             | 1.09                               | 1.09                                | 74387.13                | 805.88                  | 0.0                      | 100884.94                | 75.88                   | 75.88                    |
| 8            | 675.60                             | 10.58                              | 0.0                                 | 2083.71                             | 12.08                              | 12.08                               | 25267.30                | 395.55                  | 0.0                      | 77930.81                 | 451.92                  | 451.92                   |
| 8            | 756.35                             | 11.21                              | 0.0                                 | 1955.09                             | 12.68                              | 12.68                               | 30329.43                | 449.67                  | 0.0                      | 78399.06                 | 508.62                  | 508.62                   |
| 9            | 863.36                             | 15.40                              | 0.0                                 | 1775.46                             | 3.48                               | 3.48                                | 15195.11                | 271.06                  | 0.0                      | 31248.06                 | 61.30                   | 61.30                    |
| 10           | 974.85                             | 24.89                              | 0.0                                 | 1574.25                             | 0.82                               | 0.82                                | 7896.26                 | 201.62                  | 0.0                      | 12751.43                 | 6.67                    | 6.67                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 12.40                          | 2.48                 | 1184.59                | 14688.95             | 2.938                  | 73.08                  | 906.25               | 0.181                  | 0.13                   | 1.66                 | 0.0003                 |
| 6                       | 0.30                    | 69.30                          | 0.35                 | 1073.41                | 74387.13             | 0.372                  | 11.63                  | 805.88               | 0.004                  | 1.09                   | 75.88                | 0.0004                 |
| 7                       | 5.00                    | 69.30                          | 5.75                 | 1073.41                | 74387.13             | 6.174                  | 11.63                  | 805.88               | 0.067                  | 1.09                   | 75.88                | 0.0063                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 863.36                 | 15195.11             | 1.520                  | 15.40                  | 271.06               | 0.027                  | 3.48                   | 61.30                | 0.0061                 |
| 10                      | 4.00                    | 8.10                           | 0.54                 | 974.85                 | 7896.26              | 0.529                  | 24.89                  | 201.62               | 0.014                  | 0.82                   | 6.67                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 10.881               |                        |                      | 11.532                 |                        |                      | 0.293                  |                        |                      | 0.0136                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.060                  |                        |                      | 0.027                  |                        |                      | 0.0012                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 176 ENGINE TYPE AND MODEL: O-320-E20 SERIAL NUMBER: L-26204-27AB

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 426. HRS

FUEL: AV GAS 80/87 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 81.50 FINISH 81.00

ATMOSPHERIC PRESSURE: START 30.16 FINISH 30.16

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 72.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.60                           | 74.00                         | 0.06199           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.90                           | 103.00                        | 0.06692           |
| RUN UP      |                 | 3            | -0.0          | 26.40                          | 322.00                        | 0.06774           |
| RUN UP-LEAN |                 | 4            | -0.0          | 26.40                          | 322.00                        | 0.06412           |
| RUN UP-RICH |                 | 5            | -0.0          | 26.40                          | 323.00                        | 0.07040           |
| TAKE-OFF    |                 | 6            | -0.0          | 67.30                          | 754.00                        | 0.08368           |
| CLIMB       |                 | 7            | -0.0          | 67.30                          | 754.00                        | 0.08368           |
| DESCENT     |                 | 8            | -0.0          | 38.30                          | 493.00                        | 0.07299           |
| DESCENT     | ON              | 9            | -0.0          | 39.20                          | 491.00                        | 0.07501           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 212.00                        | 0.07272           |
| TAXI        |                 | 10           | -0.0          | 7.20                           | 89.00                         | 0.06548           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 348.00                              | -0.00                              | 3.60                     | 9.60                          | 3018.00              | 29.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 2            | 415.00                              | -0.00                              | 7.00                     | 7.10                          | 2952.00              | 25.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 3            | 818.00                              | -0.00                              | 6.10                     | 8.30                          | 2559.00              | 217.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 717.00                              | -0.00                              | 5.70                     | 7.90                          | 2493.00              | 103.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 863.00                              | -0.00                              | 6.30                     | 8.70                          | 2559.00              | 115.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1368.00                             | -0.00                              | 9.70                     | 8.10                          | 2624.00              | 60.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1368.00                             | -0.00                              | 9.70                     | 8.10                          | 2624.00              | 60.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1166.00                             | -0.00                              | 5.30                     | 10.40                         | 2427.00              | 451.00              | -0.00                    | -0.00                    | 16.00              | -0.00 | -0.00        |
| 8            | 1155.00                             | -0.00                              | 6.20                     | 9.90                          | 2427.00              | 495.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 9            | 785.00                              | -0.00                              | 6.80                     | 8.70                          | 2559.00              | 118.00              | -0.00                    | -0.00                    | 17.00              | -0.00 | -0.00        |
| 10           | 516.00                              | -0.00                              | 5.80                     | 8.10                          | 2559.00              | 37.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 518.66                             | 25.86                              | 0.0                                 | 2256.94                             | 0.71                               | 0.71                                | 3016.48                 | 144.83                  | 0.0                      | 12638.85                 | 3.99                    | 3.99                     |
| 2            | 982.39                             | 23.73                              | 0.0                                 | 1565.60                             | 0.58                               | 0.58                                | 8743.23                 | 211.17                  | 0.0                      | 13913.83                 | 5.13                    | 5.13                     |
| 3            | 840.85                             | 20.20                              | 0.0                                 | 1797.65                             | 4.91                               | 4.91                                | 22198.45                | 533.35                  | 0.0                      | 47458.01                 | 129.71                  | 129.71                   |
| 4            | 831.47                             | 20.83                              | 0.0                                 | 1810.67                             | 2.47                               | 2.47                                | 21950.91                | 549.85                  | 0.0                      | 47801.68                 | 65.15                   | 65.15                    |
| 5            | 834.27                             | 19.41                              | 0.0                                 | 1810.18                             | 2.50                               | 2.50                                | 22024.61                | 512.37                  | 0.0                      | 47788.70                 | 66.04                   | 66.04                    |
| 6            | 1084.92                            | 16.81                              | 0.0                                 | 1423.47                             | 1.10                               | 1.10                                | 73015.13                | 1131.23                 | 0.0                      | 95799.69                 | 74.18                   | 74.18                    |
| 7            | 1084.92                            | 16.81                              | 0.0                                 | 1423.47                             | 1.10                               | 1.10                                | 73015.13                | 1131.23                 | 0.0                      | 95799.69                 | 74.18                   | 74.18                    |
| 8            | 671.61                             | 17.61                              | 0.0                                 | 2070.67                             | 9.39                               | 9.39                                | 25722.56                | 674.61                  | 0.0                      | 79306.75                 | 359.53                  | 359.53                   |
| 8            | 766.43                             | 17.18                              | 0.0                                 | 1922.88                             | 10.05                              | 10.05                               | 30043.85                | 673.56                  | 0.0                      | 75376.75                 | 393.99                  | 393.99                   |
| 9            | 871.90                             | 18.79                              | 0.0                                 | 1752.73                             | 2.49                               | 2.49                                | 15345.46                | 330.74                  | 0.0                      | 30848.10                 | 43.74                   | 43.74                    |
| 10           | 827.74                             | 20.92                              | 0.0                                 | 1816.30                             | 0.87                               | 0.87                                | 5959.70                 | 150.60                  | 0.0                      | 13077.36                 | 6.24                    | 6.24                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.90                           | 1.78                 | 982.39                 | 8743.23              | 1.749                  | 23.73                  | 211.17               | 0.042                  | 0.58                   | 5.13                 | 0.0010                 |
| 6                       | 0.30                    | 67.30                          | 0.34                 | 1084.92                | 73015.13             | 0.365                  | 16.81                  | 1131.23              | 0.006                  | 1.10                   | 74.18                | 0.0004                 |
| 7                       | 5.00                    | 67.30                          | 5.59                 | 1084.92                | 73015.13             | 6.060                  | 16.81                  | 1131.23              | 0.094                  | 1.10                   | 74.18                | 0.0062                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 871.90                 | 15345.46             | 1.535                  | 18.79                  | 330.74               | 0.033                  | 2.49                   | 43.74                | 0.0044                 |
| 10                      | 4.00                    | 7.20                           | 0.48                 | 827.74                 | 5959.70              | 0.399                  | 20.92                  | 150.60               | 0.010                  | 0.87                   | 6.24                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 9.945                |                        |                      | 10.108                 |                        |                      | 0.185                  |                        |                      | 0.0123                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.016                  |                        |                      | 0.019                  |                        |                      | 0.0012                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 177 ENGINE TYPE AND MODEL: O-320-E2D

SERIAL NUMBER: L-26284-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 427. HRS

FUEL: AV GAS 80/87

FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 85.50

ATMOSPHERIC PRESSURE: START 30.16 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 66.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.60                           | 72.00                         | 0.05771           |
| IDLF/TAXI   |                 | 2            | -0.0          | 8.90                           | 100.00                        | 0.06723           |
| RUN UP      |                 | 3            | -0.0          | 27.30                          | 332.00                        | 0.06852           |
| RUN UP-LEAN |                 | 4            | -0.0          | 25.50                          | 310.00                        | 0.06186           |
| RUN UP-RICH |                 | 5            | -0.0          | 26.40                          | 323.00                        | 0.06630           |
| TAKE-OFF    |                 | 6            | -0.0          | 69.30                          | 768.00                        | 0.08386           |
| CLIMB       |                 | 7            | -0.0          | 69.30                          | 768.00                        | 0.08386           |
| DESCENT     |                 | 8            | -0.0          | 34.40                          | 468.00                        | 0.07296           |
| DESCENT     | ON              | 9            | -0.0          | 39.20                          | 488.00                        | 0.07412           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 211.00                        | 0.07320           |
| TAXI        |                 | 10           | -0.0          | 8.10                           | 98.00                         | 0.06605           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 280.00                              | -0.00                              | 3.80                     | 8.40                          | 3012.00              | 24.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 2            | 359.00                              | -0.00                              | 7.40                     | 6.70                          | 3338.00              | 17.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 3            | 740.00                              | -0.00                              | 6.20                     | 8.40                          | 2307.00              | 199.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 673.00                              | -0.00                              | 5.70                     | 7.40                          | 2307.00              | 100.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 785.00                              | -0.00                              | 6.00                     | 8.10                          | 2307.00              | 110.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1323.00                             | -0.00                              | 10.00                    | 7.80                          | 2741.00              | 59.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1323.00                             | -0.00                              | 10.00                    | 7.80                          | 2741.00              | 59.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1110.00                             | -0.00                              | 5.60                     | 10.10                         | 2144.00              | 444.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 6.40                     | 9.50                          | 2198.00              | 468.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 9            | 751.00                              | -0.00                              | 7.00                     | 8.60                          | 2524.00              | 132.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 10           | 493.00                              | -0.00                              | 6.10                     | 7.90                          | 2632.00              | 35.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 614.09                             | 27.88                              | 0.0                                 | 2132.89                             | 0.64                               | 0.64                                | 3438.91                 | 156.11                  | 0.0                      | 11944.16                 | 3.57                    | 3.57                     |
| 2            | 1035.75                            | 26.76                              | 0.0                                 | 1473.45                             | 0.39                               | 0.39                                | 9218.13                 | 238.15                  | 0.0                      | 13113.66                 | 3.48                    | 3.48                     |
| 3            | 844.56                             | 18.00                              | 0.0                                 | 1797.87                             | 4.45                               | 4.45                                | 23056.55                | 491.35                  | 0.0                      | 49081.77                 | 121.56                  | 121.56                   |
| 4            | 883.82                             | 20.02                              | 0.0                                 | 1762.05                             | 2.49                               | 2.49                                | 22027.43                | 510.60                  | 0.0                      | 44932.34                 | 63.48                   | 63.48                    |
| 5            | 845.83                             | 18.63                              | 0.0                                 | 1794.15                             | 2.55                               | 2.55                                | 22330.03                | 491.73                  | 0.0                      | 47365.41                 | 67.24                   | 67.24                    |
| 6            | 1117.75                            | 17.55                              | 0.0                                 | 1365.87                             | 1.08                               | 1.08                                | 77460.06                | 1216.00                 | 0.0                      | 94931.56                 | 75.07                   | 75.07                    |
| 7            | 1117.75                            | 17.55                              | 0.0                                 | 1369.87                             | 1.08                               | 1.08                                | 77460.06                | 1216.00                 | 0.0                      | 94931.56                 | 75.07                   | 75.07                    |
| 8            | 710.39                             | 15.59                              | 0.0                                 | 2014.52                             | 9.26                               | 9.26                                | 25876.22                | 567.39                  | 0.0                      | 73328.44                 | 336.99                  | 336.99                   |
| 9            | 802.09                             | 15.78                              | 0.0                                 | 1870.70                             | 9.63                               | 9.63                                | 31441.85                | 616.45                  | 0.0                      | 73331.38                 | 377.65                  | 377.65                   |
| 9            | 892.08                             | 18.42                              | 0.0                                 | 1722.04                             | 2.76                               | 2.76                                | 15700.64                | 324.23                  | 0.0                      | 30307.91                 | 48.63                   | 48.63                    |
| 10           | 864.00                             | 21.35                              | 0.0                                 | 1758.13                             | 0.81                               | 0.81                                | 6998.41                 | 172.94                  | 0.0                      | 14240.82                 | 6.60                    | 6.60                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.90                           | 1.78                 | 1035.75                | 9218.13              | 1.844                  | 26.76                  | 238.15               | 0.048                  | 0.34                   | 3.48                 | 0.0007                 |
| 6                       | 0.30                    | 69.30                          | 0.35                 | 1117.75                | 77460.06             | 0.387                  | 17.55                  | 1216.00              | 0.006                  | 1.09                   | 75.07                | 0.0004                 |
| 7                       | 5.00                    | 69.30                          | 5.75                 | 1117.75                | 77460.06             | 6.429                  | 17.55                  | 1216.00              | 0.101                  | 1.09                   | 75.07                | 0.0062                 |
| 9                       | 6.00                    | 17.60                          | 1.76                 | 892.08                 | 15700.64             | 1.570                  | 18.42                  | 324.23               | 0.032                  | 2.76                   | 48.63                | 0.0049                 |
| 10                      | 4.00                    | 8.10                           | 0.54                 | 864.00                 | 6998.41              | 0.469                  | 21.35                  | 172.94               | 0.012                  | 0.81                   | 6.60                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 10.181               |                        |                      | 10.699                 |                        |                      | 0.199                  |                        |                      | 0.0126                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.051                  |                        |                      | 0.020                  |                        |                      | 0.0012                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 238 ENGINE TYPE AND MODEL: O-320-E3D SERIAL NUMBER: L-29465-27AA

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 54. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.70 FINISH 29.70

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARR.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 158.00                        | 0.03596           |
| IDLE/TAXI   |                 | 2            | -0.0          | 18.80                          | 192.00                        | 0.05723           |
| RUN UP      |                 | 3            | -0.0          | 34.00                          | 372.00                        | 0.08167           |
| RUN UP-LEAN |                 | 4            | -0.0          | 31.60                          | 351.00                        | 0.08202           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 349.00                        | 0.08159           |
| TAKE-OFF    |                 | 6            | -0.0          | 75.00                          | 802.00                        | 0.08519           |
| CLIMB       |                 | 7            | -0.0          | 75.00                          | 802.00                        | 0.08519           |
| DESCENT     |                 | 8            | -0.0          | 41.00                          | 470.00                        | 0.08046           |
| DESCENT     | ON              | 8            | -0.0          | 38.70                          | 494.00                        | 0.07346           |
| APPROACH    |                 | 9            | -0.0          | 27.80                          | 290.00                        | 0.08432           |
| TAXI        |                 | 10           | -0.0          | 18.80                          | 216.00                        | 0.05092           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 314.00                              | -0.00                              | 4.20                   | 2.90                          | 4991.00              | 3.00                | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 2            | 426.00                              | -0.00                              | 7.40                   | 4.30                          | 4547.00              | 6.00                | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 953.00                              | -0.00                              | 9.90                   | 7.40                          | 2717.00              | 66.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 874.00                              | -0.00                              | 9.70                   | 7.70                          | 2717.00              | 46.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1009.00                             | -0.00                              | 9.70                   | 7.60                          | 2717.00              | 46.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1256.00                             | -0.00                              | 10.90                  | 7.20                          | 2052.00              | 41.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1256.00                             | -0.00                              | 10.90                  | 7.20                          | 2052.00              | 41.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 8.90                   | 8.30                          | 1885.00              | 60.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1177.00                             | -0.00                              | 5.50                   | 10.40                         | 1442.00              | 482.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 10           | 896.00                              | -0.00                              | 10.50                  | 7.20                          | 4215.00              | 44.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 437.00                              | -0.00                              | 5.30                   | 5.40                          | 1775.00              | 21.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1116.58                            | 75.99                              | 0.0                                 | 1211.37                             | 0.13                               | 0.13                                | 16971.97                | 1155.09                 | 0.0                      | 18412.78                 | 1.99                    | 1.99                     |
| 2            | 1229.96                            | 43.28                              | 0.0                                 | 1122.96                             | 0.16                               | 0.16                                | 23123.14                | 813.74                  | 0.0                      | 21111.62                 | 3.08                    | 3.08                     |
| 3            | 1138.21                            | 17.69                              | 0.0                                 | 1336.77                             | 1.25                               | 1.25                                | 38699.22                | 608.28                  | 0.0                      | 45450.32                 | 42.38                   | 42.38                    |
| 4            | 1108.91                            | 17.74                              | 0.0                                 | 1383.10                             | 0.86                               | 0.86                                | 35041.46                | 562.14                  | 0.0                      | 43705.81                 | 27.30                   | 27.30                    |
| 5            | 1115.22                            | 17.89                              | 0.0                                 | 1372.90                             | 0.87                               | 0.87                                | 35240.89                | 565.34                  | 0.0                      | 43383.68                 | 27.45                   | 27.45                    |
| 6            | 1202.97                            | 12.97                              | 0.0                                 | 1248.53                             | 0.74                               | 0.74                                | 90222.44                | 972.77                  | 0.0                      | 93639.56                 | 55.74                   | 55.74                    |
| 7            | 1202.97                            | 12.97                              | 0.0                                 | 1248.53                             | 0.74                               | 0.74                                | 90222.44                | 972.77                  | 0.0                      | 93639.56                 | 55.74                   | 55.74                    |
| 8            | 1034.02                            | 12.54                              | 0.0                                 | 1515.15                             | 1.15                               | 1.15                                | 42394.89                | 514.26                  | 0.0                      | 62121.20                 | 46.95                   | 46.95                    |
| 9            | 692.54                             | 10.40                              | 0.0                                 | 2057.57                             | 9.97                               | 9.97                                | 26801.39                | 402.44                  | 0.0                      | 79628.06                 | 385.80                  | 385.80                   |
| 10           | 1170.57                            | 26.91                              | 0.0                                 | 1261.18                             | 0.81                               | 0.81                                | 32541.79                | 748.16                  | 0.0                      | 35060.89                 | 22.40                   | 22.40                    |
| 10           | 984.35                             | 18.88                              | 0.0                                 | 1575.81                             | 0.64                               | 0.64                                | 18505.72                | 354.96                  | 0.0                      | 29625.27                 | 12.04                   | 12.04                    |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 18.80                          | 3.76                 | 1229.96                | 23123.14             | 4.625                  | 43.28                  | 813.74               | 0.163                  | 0.16                   | 3.08                 | 0.0006                 |
| 6                       | 0.30                    | 75.00                          | 0.37                 | 1202.97                | 90222.44             | 0.451                  | 12.97                  | 972.77               | 0.005                  | 0.74                   | 55.74                | 0.0003                 |
| 7                       | 5.00                    | 75.00                          | 6.22                 | 1202.97                | 90222.44             | 7.488                  | 12.97                  | 972.77               | 0.081                  | 0.74                   | 55.74                | 0.0046                 |
| 9                       | 6.00                    | 27.80                          | 2.78                 | 1170.57                | 32541.79             | 3.254                  | 26.91                  | 748.16               | 0.075                  | 0.81                   | 22.40                | 0.0022                 |
| 10                      | 4.00                    | 18.80                          | 1.26                 | 984.35                 | 18505.72             | 1.240                  | 18.88                  | 354.96               | 0.024                  | 0.64                   | 12.04                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 14.400               |                        |                      | 17.058                 |                        |                      | 0.347                  |                        |                      | 0.0086                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.185                  |                        |                      | 0.024                  |                        |                      | 0.0006                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 239

ENGINE TYPE AND MODEL: D-320-E30

SERIAL NUMBER: L-29465-27AB

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 55. HRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.70 FINISH 29.70

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 181.00                        | 0.03331           |
| IDLE/TAXI   |                 | 2            | -0.0          | 18.80                          | 212.00                        | 0.05306           |
| RUN UP      |                 | 3            | -0.0          | 32.80                          | 360.00                        | 0.08264           |
| RUN UP-LEAN |                 | 4            | -0.0          | 32.80                          | 362.00                        | 0.08190           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 350.00                        | 0.08256           |
| TAKE-OFF    |                 | 6            | -0.0          | 72.70                          | 785.00                        | 0.08597           |
| CLIMB       |                 | 7            | -0.0          | 72.70                          | 785.00                        | 0.08597           |
| DESCENT     |                 | 8            | -0.0          | 43.40                          | 500.00                        | 0.08041           |
| DESCENT     | ON              | 8            | -0.0          | 39.80                          | 508.00                        | 0.07440           |
| APPROACH    |                 | 9            | -0.0          | 23.40                          | 252.00                        | 0.08387           |
| TAXI        |                 | 10           | -0.0          | 17.60                          | 204.00                        | 0.04903           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 269.00                              | -0.00                              | 3.10                     | 3.80                          | 1709.00              | 9.00                | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | 381.00                              | -0.00                              | 5.80                     | 5.30                          | 2269.00              | 16.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 3            | 953.00                              | -0.00                              | 10.00                    | 7.50                          | 2885.00              | 71.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 886.00                              | -0.00                              | 9.70                     | 7.60                          | 3389.00              | 56.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1009.00                             | -0.00                              | 9.80                     | 7.70                          | 2885.00              | 55.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 10.80                    | 7.50                          | 1989.00              | 68.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1278.00                             | -0.00                              | 10.80                    | 7.50                          | 1989.00              | 68.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1155.00                             | -0.00                              | 8.70                     | 8.50                          | 1933.00              | 78.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1177.00                             | -0.00                              | 5.70                     | 10.40                         | 1485.00              | 508.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 897.00                              | -0.00                              | 10.50                    | 7.10                          | 4174.00              | 48.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 10           | 415.00                              | -0.00                              | 5.00                     | 5.30                          | 1709.00              | 22.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 885.70                             | 27.96                              | 0.0                                 | 1705.88                             | 0.42                               | 0.42                                | 13462.71                | 425.07                  | 0.0                      | 25929.39                 | 6.42                    | 6.42                     |
| 2            | 1034.47                            | 23.18                              | 0.0                                 | 1485.27                             | 0.47                               | 0.47                                | 19448.06                | 435.74                  | 0.0                      | 27923.02                 | 8.81                    | 8.81                     |
| 3            | 1135.70                            | 18.77                              | 0.0                                 | 1338.33                             | 1.32                               | 1.32                                | 37250.84                | 615.50                  | 0.0                      | 43897.08                 | 43.44                   | 43.44                    |
| 4            | 1110.97                            | 22.23                              | 0.0                                 | 1367.67                             | 1.05                               | 1.05                                | 36439.79                | 729.16                  | 0.0                      | 44859.62                 | 34.56                   | 34.56                    |
| 5            | 1112.98                            | 18.77                              | 0.0                                 | 1374.01                             | 1.03                               | 1.03                                | 35170.25                | 592.98                  | 0.0                      | 43418.84                 | 32.42                   | 32.42                    |
| 6            | 1179.45                            | 12.44                              | 0.0                                 | 1286.93                             | 1.22                               | 1.22                                | 85745.94                | 904.42                  | 0.0                      | 93559.81                 | 88.68                   | 88.68                    |
| 7            | 1179.45                            | 12.44                              | 0.0                                 | 1286.93                             | 1.22                               | 1.22                                | 85745.94                | 904.42                  | 0.0                      | 93559.81                 | 88.68                   | 88.68                    |
| 8            | 1010.51                            | 12.86                              | 0.0                                 | 1551.23                             | 1.49                               | 1.49                                | 43855.97                | 558.07                  | 0.0                      | 67321.44                 | 64.58                   | 64.58                    |
| 8            | 708.70                             | 10.57                              | 0.0                                 | 2031.70                             | 10.37                              | 10.37                               | 28206.31                | 420.87                  | 0.0                      | 80861.69                 | 412.91                  | 412.91                   |
| 9            | 1177.33                            | 26.80                              | 0.0                                 | 1250.85                             | 0.88                               | 0.88                                | 27549.56                | 627.22                  | 0.0                      | 29269.94                 | 20.69                   | 20.69                    |
| 10           | 964.69                             | 18.88                              | 0.0                                 | 1606.69                             | 0.70                               | 0.70                                | 16978.53                | 332.37                  | 0.0                      | 28277.71                 | 12.27                   | 12.27                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 18.80                          | 3.76                 | 1034.47                | 19448.06             | 3.890                  | 23.18                  | 435.74               | 0.087                  | 0.47                   | 8.81                 | 0.0018                 |
| 6                       | 0.30                    | 72.70                          | 0.36                 | 1179.45                | 85745.94             | 0.429                  | 12.44                  | 904.42               | 0.005                  | 1.72                   | 83.68                | 0.0004                 |
| 7                       | 5.00                    | 72.70                          | 6.03                 | 1179.45                | 85745.94             | 7.117                  | 12.44                  | 904.42               | 0.075                  | 1.72                   | 83.68                | 0.0074                 |
| 9                       | 6.00                    | 23.40                          | 2.34                 | 1177.33                | 27549.56             | 2.755                  | 26.80                  | 627.22               | 0.063                  | 0.88                   | 20.69                | 0.0021                 |
| 10                      | 4.00                    | 17.60                          | 1.18                 | 964.69                 | 16978.53             | 1.138                  | 18.88                  | 332.37               | 0.022                  | 0.70                   | 12.27                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 13.677               |                        |                      | 15.328                 |                        |                      | 0.252                  |                        |                      | 0.0125                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.121                  |                        |                      | 0.018                  |                        |                      | 0.0009                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 240 ENGINE TYPE AND MODEL: O-320-E30

SERIAL NUMBER: L-29465-27AC

RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 55. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 29.70 FINISH 29.70

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 16.40                          | 198.00                        | 0.03274           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 225.00                        | 0.05772           |
| RUN UP      |                 | 3            | -0.0          | 32.80                          | 360.00                        | 0.08132           |
| RUN UP-LEAN |                 | 4            | -0.0          | 32.80                          | 363.00                        | 0.08065           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 350.00                        | 0.08042           |
| TAKE-OFF    |                 | 6            | -0.0          | 75.00                          | 813.00                        | 0.08282           |
| CLIMB       |                 | 7            | -0.0          | 75.00                          | 813.00                        | 0.08282           |
| DESCENT     |                 | 8            | -0.0          | 44.50                          | 517.00                        | 0.07814           |
| DESCENT     | ON              | 8            | -0.0          | 39.80                          | 506.00                        | 0.07315           |
| APPROACH    |                 | 9            | -0.0          | 27.00                          | 287.00                        | 0.08373           |
| TAXI        |                 | 10           | -0.0          | 18.80                          | 220.00                        | 0.04848           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 258.00                              | -0.00                              | 2.90                     | 3.90                          | 1537.00              | 9.00                | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | 415.00                              | -0.00                              | 6.40                     | 5.70                          | 2416.00              | 18.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 3            | 874.00                              | -0.00                              | 9.80                     | 7.40                          | 2965.00              | 66.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 830.00                              | -0.00                              | 9.50                     | 7.50                          | 3623.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 942.00                              | -0.00                              | 9.50                     | 7.50                          | 3129.00              | 47.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 10.30                    | 7.30                          | 2086.00              | 27.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1278.00                             | -0.00                              | 10.30                    | 7.30                          | 2086.00              | 27.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1188.00                             | -0.00                              | 8.30                     | 8.40                          | 1976.00              | 73.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1166.00                             | -0.00                              | 5.70                     | 10.10                         | 1537.00              | 443.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 10.60                    | 7.00                          | 3788.00              | 43.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 448.00                              | -0.00                              | 4.80                     | 5.40                          | 1592.00              | 22.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 842.53                             | 25.57                              | 0.0                                 | 1780.28                             | 0.43                               | 0.43                                | 13817.43                | 419.42                  | 0.0                      | 29196.61                 | 7.04                    | 7.04                     |
| 2            | 1047.64                            | 22.65                              | 0.0                                 | 1466.03                             | 0.48                               | 0.48                                | 20847.93                | 450.74                  | 0.0                      | 29174.02                 | 9.63                    | 9.63                     |
| 3            | 1131.56                            | 19.61                              | 0.0                                 | 1342.57                             | 1.25                               | 1.25                                | 37115.08                | 643.12                  | 0.0                      | 44034.62                 | 41.06                   | 41.06                    |
| 4            | 1105.40                            | 24.14                              | 0.0                                 | 1371.18                             | -0.00                              | -0.00                               | 36257.00                | 791.92                  | 0.0                      | 44974.64                 | -0.00                   | -0.00                    |
| 5            | 1108.55                            | 20.91                              | 0.0                                 | 1375.09                             | 0.90                               | 0.90                                | 35030.20                | 660.80                  | 0.0                      | 43452.86                 | 28.47                   | 28.47                    |
| 6            | 1168.45                            | 13.55                              | 0.0                                 | 1301.17                             | 0.50                               | 0.50                                | 87633.56                | 1016.47                 | 0.0                      | 97587.50                 | 37.73                   | 37.73                    |
| 7            | 1168.45                            | 13.55                              | 0.0                                 | 1301.17                             | 0.50                               | 0.50                                | 87633.56                | 1016.47                 | 0.0                      | 97587.50                 | 37.73                   | 37.73                    |
| 8            | 992.33                             | 13.53                              | 0.0                                 | 1577.95                             | 1.43                               | 1.43                                | 44158.55                | 602.10                  | 0.0                      | 70218.94                 | 63.79                   | 63.79                    |
| 8            | 721.80                             | 11.15                              | 0.0                                 | 2009.56                             | 9.21                               | 9.21                                | 28727.52                | 443.65                  | 0.0                      | 79980.25                 | 366.73                  | 366.73                   |
| 9            | 1191.10                            | 24.38                              | 0.0                                 | 1235.88                             | 0.79                               | 0.79                                | 32159.61                | 658.20                  | 0.0                      | 33368.83                 | 21.43                   | 21.43                    |
| 10           | 936.09                             | 17.78                              | 0.0                                 | 1654.66                             | 0.70                               | 0.70                                | 17598.43                | 374.29                  | 0.0                      | 31107.51                 | 13.25                   | 13.25                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 19.90                          | 3.48                 | 1047.64                | 20847.93             | 4.170                  | 22.65                  | 450.74               | 0.090                  | 0.48                   | 9.63                 | 0.0019                 |
| 6                       | 0.30            | 75.00                          | 0.37                 | 1168.45                | 87633.56             | 0.438                  | 13.55                  | 1016.47              | 0.005                  | 0.50                   | 37.73                | 0.0002                 |
| 7                       | 5.00            | 75.00                          | 6.22                 | 1168.45                | 87633.56             | 7.274                  | 13.55                  | 1016.47              | 0.084                  | 0.50                   | 37.73                | 0.0031                 |
| 4                       | 6.00            | 27.00                          | 2.70                 | 1191.10                | 32159.61             | 3.216                  | 24.38                  | 658.20               | 0.066                  | 0.79                   | 21.43                | 0.0021                 |
| 10                      | 4.00            | 18.80                          | 1.26                 | 936.09                 | 17598.43             | 1.174                  | 17.78                  | 334.29               | 0.022                  | 0.70                   | 13.25                | 0.0009                 |
| TOTAL FOR CYCLE         |                 |                                | 14.540               |                        |                      | 16.276                 |                        |                      | 0.268                  |                        |                      | 0.0083                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 1.119                  |                        |                      | 0.018                  |                        |                      | 0.0006                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 226 ENGINE TYPE AND MODEL: IO-360-A/B SERIAL NUMBER: L-6967-51AA

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 62. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.50 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.10 FINISH 30.10

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 8

COMMENTS:

|           | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-----------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW  |                 | 1            | -0.0          | 16.40                          | 170.00                        | 0.06413           |
| IDLE/TAXI |                 | 2            | -0.0          | 17.60                          | 222.00                        | 0.05427           |
| RUN UP    |                 | 3            | -0.0          | 46.90                          | 562.00                        | 0.06980           |
| TAKE-OFF  |                 | 6            | -0.0          | 91.40                          | 1026.00                       | 0.08125           |
| CLIMB     |                 | 7            | -0.0          | 70.30                          | 788.00                        | 0.07946           |
| DESCENT   |                 | 8            | -0.0          | 62.10                          | 686.00                        | 0.08059           |
| APPROACH  |                 | 9            | -0.0          | 48.10                          | 531.00                        | 0.08070           |
| TAXI      |                 | 10           | -0.0          | 18.80                          | 197.00                        | 0.07075           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-----------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 6.90                   | 5.70                        | 11094.00             | -0.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 4.00                   | 7.40                        | 3031.00              | -0.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 6.60                   | 8.20                        | 2910.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 9.40                   | 7.90                        | 2243.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 9.20                   | 7.70                        | 2243.00              | -0.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 9.60                   | 7.50                        | 2486.00              | -0.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 9.60                   | 7.50                        | 2728.00              | -0.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 8.90                   | 5.60                        | 6062.00              | -0.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1016.79                            | 93.63                              | 0.0                                 | 1319.77                             | -0.00                              | -0.00                               | 16675.38                | 1535.54                 | 0.0                      | 21644.13                 | -0.00                   | -0.00                    |
| 2            | 690.50                             | 29.97                              | 0.0                                 | 2007.11                             | -0.00                              | -0.00                               | 12152.71                | 527.41                  | 0.0                      | 35325.10                 | -0.00                   | -0.00                    |
| 3            | 883.54                             | 22.31                              | 0.0                                 | 1724.79                             | 4.60                               | 4.60                                | 41438.17                | 1046.39                 | 0.0                      | 80892.58                 | 215.54                  | 215.54                   |
| 6            | 1083.65                            | 14.81                              | 0.0                                 | 1430.96                             | 2.37                               | 2.37                                | 99045.56                | 1353.57                 | 0.0                      | 130789.38                | 216.34                  | 216.34                   |
| 7            | 1085.37                            | 15.16                              | 0.0                                 | 1427.31                             | 2.91                               | 2.91                                | 76301.31                | 1065.41                 | 0.0                      | 100339.81                | 204.34                  | 204.34                   |
| 8            | 1117.91                            | 16.58                              | 0.0                                 | 1372.26                             | 2.79                               | 2.79                                | 69422.44                | 1029.62                 | 0.0                      | 85217.44                 | 173.42                  | 173.42                   |
| 9            | 1116.36                            | 18.17                              | 0.0                                 | 1370.35                             | 2.85                               | 2.85                                | 53696.78                | 873.91                  | 0.0                      | 65913.81                 | 136.89                  | 136.89                   |
| 10           | 1190.25                            | 46.43                              | 0.0                                 | 1176.72                             | -0.00                              | -0.00                               | 22376.60                | 872.90                  | 0.0                      | 22122.31                 | -0.00                   | -0.00                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 17.60                          | 3.52                 | 690.50                 | 12152.71             | 2.431                  | 29.97                  | 527.41               | 0.105                  | -0.00                  | -0.00                | -0.0000                |
| 6                       | 0.30                    | 91.40                          | 0.46                 | 1083.65                | 99045.56             | 0.495                  | 14.81                  | 1353.57              | 0.007                  | 2.37                   | 216.34               | 0.0011                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1085.37                | 76301.31             | 6.333                  | 15.16                  | 1065.41              | 0.088                  | 2.91                   | 204.34               | 0.0170                 |
| 9                       | 6.00                    | 48.10                          | 4.81                 | 1116.36                | 53696.78             | 5.370                  | 18.17                  | 873.91               | 0.087                  | 2.85                   | 136.89               | 0.0137                 |
| 10                      | 4.00                    | 18.80                          | 1.26                 | 1190.25                | 22376.60             | 1.499                  | 46.43                  | 872.90               | 0.058                  | -0.00                  | -0.00                | -0.0000                |
| TOTAL FOR CYCLE         |                         |                                | 15.881               |                        |                      | 16.128                 |                        |                      | 0.347                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.016                  |                        |                      | 0.022                  |                        |                      | -0.0000                |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 227 ENGINE TYPE AND MODEL: IO-360-A/B SERIAL NUMBER: L-6967-5148

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 62. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.50 FINISH 80.50

ATMOSPHERIC PRESSURE: START 30.12 FINISH 30.12

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 8

COMMENTS:

|           | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-----------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW  |                 | 1            | -0.0          | 12.90                          | 131.00                        | 0.06720           |
| IDLE/TAXI |                 | 2            | -0.0          | 18.80                          | 230.00                        | 0.06618           |
| RUN UP    |                 | 3            | -0.0          | 44.50                          | 502.00                        | 0.07622           |
| TAKE-OFF  |                 | 6            | -0.0          | 93.80                          | 1024.00                       | 0.08427           |
| CLIMB     |                 | 7            | -0.0          | 71.50                          | 777.00                        | 0.08339           |
| DESCENT   |                 | 8            | -0.0          | 64.50                          | 704.00                        | 0.08340           |
| APPROACH  |                 | 9            | -0.0          | 44.50                          | 484.00                        | 0.08268           |
| TAXI      |                 | 10           | -0.0          | 17.60                          | 165.00                        | 0.08982           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYOES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 6.10                     | 6.30                          | 20079.00             | 47.00               | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 5.30                     | 8.40                          | 6286.00              | 150.00              | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 8.60                     | 7.50                          | 3143.00              | 160.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 10.30                    | 7.60                          | 2444.00              | 69.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 10.30                    | 7.40                          | 2386.00              | 100.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 10.20                    | 7.50                          | 2503.00              | 121.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 10.20                    | 7.30                          | 2794.00              | 123.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 11.50                    | 6.00                          | 16936.00             | 44.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 855.32                             | 161.25                             | 0.0                                 | 1387.97                             | 1.08                               | 1.08                                | 11033.69                | 2080.07                 | 0.0                      | 17904.80                 | 13.96                   | 13.96                    |
| 2            | 747.26                             | 50.76                              | 0.0                                 | 1860.87                             | 3.47                               | 3.47                                | 14048.54                | 954.28                  | 0.0                      | 34984.31                 | 65.31                   | 65.31                    |
| 3            | 1038.47                            | 22.15                              | 0.0                                 | 1450.37                             | 3.23                               | 3.23                                | 47101.85                | 985.89                  | 0.0                      | 64541.46                 | 143.94                  | 143.94                   |
| 6            | 1146.82                            | 15.58                              | 0.0                                 | 1329.57                             | 1.26                               | 1.26                                | 107571.94               | 1461.87                 | 0.0                      | 124713.50                | 118.37                  | 118.37                   |
| 7            | 1159.98                            | 15.39                              | 0.0                                 | 1309.43                             | 1.85                               | 1.85                                | 82938.50                | 1100.36                 | 0.0                      | 93624.38                 | 132.26                  | 132.26                   |
| 8            | 1147.97                            | 16.13                              | 0.0                                 | 1326.26                             | 2.24                               | 2.24                                | 74044.00                | 1040.63                 | 0.0                      | 85543.88                 | 144.28                  | 144.28                   |
| 9            | 1159.00                            | 18.18                              | 0.0                                 | 1303.30                             | 2.30                               | 2.30                                | 51575.68                | 809.13                  | 0.0                      | 57997.01                 | 102.16                  | 102.16                   |
| 10           | 1210.44                            | 102.09                             | 0.0                                 | 992.28                              | 0.76                               | 0.76                                | 21303.72                | 1796.86                 | 0.0                      | 17464.14                 | 13.39                   | 13.39                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 18.80                          | 3.76                 | 747.26                 | 14048.54             | 2.810                  | 50.76                  | 954.28               | 0.191                  | 3.47                   | 65.31                | 0.0131                 |
| 6                       | 0.30                    | 93.80                          | 0.47                 | 1146.82                | 107571.94            | 0.538                  | 15.58                  | 1461.87              | 0.007                  | 1.26                   | 118.37               | 0.0006                 |
| 7                       | 5.00                    | 71.50                          | 5.93                 | 1159.98                | 82938.50             | 6.884                  | 15.39                  | 1100.36              | 0.091                  | 1.85                   | 132.26               | 0.0110                 |
| 9                       | 6.00                    | 44.50                          | 4.45                 | 1159.00                | 51575.68             | 5.158                  | 18.18                  | 809.13               | 0.081                  | 2.30                   | 102.16               | 0.0102                 |
| 10                      | 4.00                    | 17.60                          | 1.18                 | 1210.44                | 21303.72             | 1.427                  | 102.09                 | 1796.86              | 0.120                  | 0.76                   | 13.39                | 0.0009                 |
| TOTAL FOR CYCLE         |                         |                                | 15.793               |                        |                      | 16.816                 |                        |                      | 0.491                  |                        |                      | 0.0357                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.065                  |                        |                      | 0.031                  |                        |                      | 0.0023                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 228 ENGINE TYPE AND MODEL: ID-360-A/B

SERIAL NUMBER: L-6967-51AC

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 63. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.50 FINISH 87.00

ATMOSPHERIC PRESSURE: START 30.10 FINISH 30.10

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 8

COMMENTS:

|           | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-----------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW  |                 | 1            | -0.0          | 16.40                          | 182.00                        | 0.07104           |
| IDLE/TAXI |                 | 2            | -0.0          | 17.60                          | 200.00                        | 0.07382           |
| RUN UP    |                 | 3            | -0.0          | 46.90                          | 549.00                        | 0.07522           |
| TAKE-OFF  |                 | 6            | -0.0          | 105.50                         | 1146.00                       | 0.08801           |
| CLIMB     |                 | 7            | -0.0          | 73.80                          | 810.00                        | 0.08507           |
| DESCENT   |                 | 8            | -0.0          | 64.50                          | 708.00                        | 0.08510           |
| APPROACH  |                 | 9            | -0.0          | 46.90                          | 513.00                        | 0.08484           |
| TAXI      |                 | 10           | -0.0          | 18.80                          | 182.00                        | 0.08262           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 426.00                              | -0.00                              | 6.90                     | 7.40                          | 10028.00             | 46.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 2            | 471.00                              | -0.00                              | 7.80                     | 7.50                          | 6029.00              | 58.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 3            | 930.00                              | -0.00                              | 7.70                     | 8.30                          | 2626.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1211.00                             | -0.00                              | 10.90                    | 7.80                          | 2626.00              | 149.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1267.00                             | -0.00                              | 10.30                    | 7.80                          | 2328.00              | 142.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 10.30                    | 7.80                          | 2388.00              | 149.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 10.30                    | 7.70                          | 2746.00              | 152.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 538.00                              | -0.00                              | 9.60                     | 6.30                          | 17908.00             | 132.00              | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 910.92                             | 75.82                              | 0.0                                 | 1534.97                             | 1.00                               | 1.00                                | 14939.07                | 1243.47                 | 0.0                      | 25173.54                 | 16.36                   | 16.36                    |
| 2            | 990.88                             | 43.86                              | 0.0                                 | 1497.01                             | 1.21                               | 1.21                                | 17439.44                | 772.02                  | 0.0                      | 26347.36                 | 21.30                   | 21.30                    |
| 3            | 956.54                             | 18.68                              | 0.0                                 | 1620.05                             | -0.00                              | -0.00                               | 44861.66                | 876.24                  | 0.0                      | 75980.25                 | -0.00                   | -0.00                    |
| 6            | 1161.26                            | 16.02                              | 0.0                                 | 1305.68                             | 2.61                               | 2.61                                | 122513.13               | 1690.43                 | 0.0                      | 137749.19                | 275.08                  | 275.08                   |
| 7            | 1135.04                            | 14.69                              | 0.0                                 | 1350.54                             | 2.57                               | 2.57                                | 83765.75                | 1084.32                 | 0.0                      | 99669.44                 | 189.69                  | 189.69                   |
| 8            | 1134.67                            | 15.07                              | 0.0                                 | 1350.09                             | 2.70                               | 2.70                                | 73185.94                | 971.78                  | 0.0                      | 87080.94                 | 173.90                  | 173.90                   |
| 9            | 1138.65                            | 17.39                              | 0.0                                 | 1337.47                             | 2.76                               | 2.76                                | 53402.79                | 815.40                  | 0.0                      | 62727.17                 | 129.45                  | 129.45                   |
| 10           | 1096.29                            | 117.12                             | 0.0                                 | 1130.40                             | 2.48                               | 2.48                                | 20610.24                | 2201.93                 | 0.0                      | 21251.55                 | 46.55                   | 46.55                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 17.60                          | 3.52                 | 990.88                 | 17439.44             | 3.488                  | 43.86                  | 772.02               | 0.154                  | 1.21                   | 21.30                | 0.0043                 |
| 6                       | 0.30                    | 105.50                         | 0.53                 | 1161.26                | 122513.13            | 0.613                  | 16.02                  | 1690.43              | 0.008                  | 2.61                   | 275.08               | 0.0014                 |
| 7                       | 5.00                    | 73.80                          | 6.13                 | 1135.04                | 83765.75             | 6.953                  | 14.69                  | 1084.32              | 0.090                  | 2.57                   | 184.69               | 0.0157                 |
| 9                       | 6.00                    | 46.90                          | 4.69                 | 1138.65                | 53402.79             | 5.340                  | 17.39                  | 815.40               | 0.082                  | 2.76                   | 129.45               | 0.0129                 |
| 10                      | 4.00                    | 18.80                          | 1.26                 | 1096.29                | 20610.24             | 1.381                  | 117.12                 | 2201.93              | 0.148                  | 2.48                   | 46.55                | 0.0031                 |
| TOTAL FOR CYCLE         |                         |                                | 16.122               |                        |                      | 17.774                 |                        |                      | 0.482                  |                        |                      | 0.0374                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.102                  |                        |                      | 0.030                  |                        |                      | 0.0023                 |

DATE: 0/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 271 ENGINE TYPE AND MODEL: IO-360-A1A SERIAL NUMBER: L-2920-51AA

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 1023. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 30.20 FINISH 30.20

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 36.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | 5.90                           | 58.00                         | 0.05994           |
| IOLE/TAXI   |                 | 2            | -0.0          | 9.40                           | 96.00                         | 0.06673           |
| RUN UP      |                 | 3            | -0.0          | 27.00                          | 324.00                        | 0.06985           |
| RUN UP-LEAN |                 | 4            | -0.0          | 27.00                          | 323.00                        | 0.06988           |
| RUN UP-RICH |                 | 5            | -0.0          | 27.00                          | 323.00                        | 0.06988           |
| TAKE-OFF    |                 | 6            | -0.0          | 98.40                          | 1060.00                       | 0.07696           |
| CLIMB       |                 | 7            | -0.0          | 70.30                          | 778.00                        | 0.07541           |
| DESCENT     |                 | 8            | -0.0          | 58.60                          | 646.00                        | 0.07407           |
| APPROACH    |                 | 9            | -0.0          | 31.60                          | 371.00                        | 0.07092           |
| TAXI        |                 | 10           | -0.0          | 9.40                           | 94.00                         | 0.06544           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 448.00                              | -0.00                              | 8.80                     | 3.90                          | -0.00                | 6.00                | -0.00                    | -0.00                    | 66.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 9.30                     | 4.90                          | -0.00                | -0.00               | -0.00                    | -0.00                    | 45.00              | -0.00 | -0.00        |
| 3            | 1031.00                             | -0.00                              | 6.90                     | 8.20                          | -0.00                | 448.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 998.00                              | -0.00                              | 7.00                     | 8.10                          | -0.00                | 303.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1031.00                             | -0.00                              | 7.00                     | 8.10                          | -0.00                | 242.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1233.00                             | -0.00                              | 9.90                     | 6.60                          | -0.00                | 139.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1233.00                             | -0.00                              | 9.20                     | 7.00                          | -0.00                | 193.00              | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 8            | 1188.00                             | -0.00                              | 9.10                     | 6.80                          | -0.00                | 218.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 7.50                     | 7.80                          | -0.00                | 402.00              | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 10           | 673.00                              | -0.00                              | 9.40                     | 4.50                          | -0.00                | 113.00              | -0.00                    | -0.00                    | 26.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1399.85                            | -0.00                              | 0.0                                 | 974.77                              | 0.16                               | 0.16                                | 8259.10                 | -0.00                   | 0.0                      | 5751.13                  | 0.92                    | 0.92                     |
| 2            | 1323.11                            | -0.00                              | 0.0                                 | 1095.34                             | -0.00                              | -0.00                               | 12437.25                | -0.00                   | 0.0                      | 10296.17                 | -0.00                   | -0.00                    |
| 3            | 923.15                             | -0.00                              | 0.0                                 | 1723.76                             | 9.85                               | 9.85                                | 24925.14                | -0.00                   | 0.0                      | 46541.55                 | 265.82                  | 265.82                   |
| 4            | 936.53                             | -0.00                              | 0.0                                 | 1702.74                             | 6.66                               | 6.66                                | 25286.38                | -0.00                   | 0.0                      | 45973.95                 | 179.78                  | 179.78                   |
| 5            | 936.53                             | -0.00                              | 0.0                                 | 1702.74                             | 5.32                               | 5.32                                | 25286.38                | -0.00                   | 0.0                      | 45973.95                 | 143.59                  | 143.59                   |
| 6            | 1212.14                            | -0.00                              | 0.0                                 | 1269.70                             | 2.80                               | 2.80                                | 119274.56               | -0.00                   | 0.0                      | 124938.13                | 275.07                  | 275.07                   |
| 7            | 1147.29                            | -0.00                              | 0.0                                 | 1371.59                             | 3.95                               | 3.95                                | 80654.69                | -0.00                   | 0.0                      | 96422.44                 | 277.92                  | 277.92                   |
| 8            | 1156.24                            | -0.00                              | 0.0                                 | 1357.54                             | 4.55                               | 4.55                                | 67755.31                | -0.00                   | 0.0                      | 79551.63                 | 266.61                  | 266.61                   |
| 9            | 990.31                             | -0.00                              | 0.0                                 | 1618.24                             | 8.72                               | 8.72                                | 31293.82                | -0.00                   | 0.0                      | 51136.38                 | 275.51                  | 275.51                   |
| 10           | 1366.20                            | -0.00                              | 0.0                                 | 1027.63                             | 2.70                               | 2.70                                | 12842.30                | -0.00                   | 0.0                      | 9659.74                  | 25.36                   | 25.36                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 9.40                           | 1.88                 | 1323.11                | 12437.25             | 2.487                  | -0.00                  | -0.00                | -0.000                 | -0.00                  | -0.00                | -0.0000                |
| 6                       | 0.30                    | 98.40                          | 0.49                 | 1212.14                | 119274.56            | 0.596                  | -0.00                  | -0.00                | -0.000                 | 2.80                   | 275.07               | 0.0014                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1147.29                | 80654.69             | 6.694                  | -0.00                  | -0.00                | -0.000                 | 3.95                   | 277.92               | 0.0231                 |
| 9                       | 6.00                    | 31.60                          | 1.16                 | 990.31                 | 31293.82             | 3.129                  | -0.00                  | -0.00                | -0.000                 | 8.72                   | 275.51               | 0.0276                 |
| 10                      | 4.00                    | 9.40                           | 0.63                 | 1366.20                | 12842.30             | 0.860                  | -0.00                  | -0.00                | -0.000                 | 2.70                   | 25.36                | 0.0017                 |
| TOTAL FOR CYCLE         |                         |                                | 11.997               |                        |                      | 13.768                 |                        |                      | -0.000                 |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.148                  |                        |                      | -0.000                 |                        |                      | -0.0000                |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 272 ENGINE TYPE AND MODEL: IO-360-A1A SERIAL NUMBER: L-2928-51AB  
 RATED HORSEPOWER: 200.  
 ENGINE TOTAL TIME: 1023. HRS  
 FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00  
 ATMOSPHERIC PRESSURE: START 30.18 FINISH 30.18  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02  
 RELATIVE HUMIDITY: 77.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 36.00                         | 0.08078           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.20                           | 79.00                         | 0.07161           |
| RUN UP      |                 | 3            | -0.0          | 30.50                          | 373.00                        | 0.06684           |
| RUN UP-LEAN |                 | 4            | -0.0          | 30.50                          | 374.00                        | 0.06638           |
| RUN UP-RICH |                 | 5            | -0.0          | 30.50                          | 373.00                        | 0.06715           |
| TAKE-OFF    |                 | 6            | -0.0          | 93.80                          | 1036.00                       | 0.07649           |
| CLIMB       |                 | 7            | -0.0          | 70.30                          | 774.00                        | 0.07650           |
| DESCENT     |                 | 8            | -0.0          | 58.60                          | 660.00                        | 0.07140           |
| APPROACH    |                 | 9            | -0.0          | 29.30                          | 340.00                        | 0.06900           |
| TAXI        |                 | 10           | -0.0          | 8.20                           | 62.00                         | 0.08129           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 549.00                              | -0.00                              | 8.80                     | 4.30                          | 40464.00             | 6.00                | -0.00                    | -0.00                    | 38.00              | -0.00 | -0.00        |
| 2            | 583.00                              | -0.00                              | 8.60                     | 5.30                          | 13711.00             | 17.00               | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |
| 3            | 1087.00                             | -0.00                              | 5.90                     | 8.30                          | 2620.00              | 378.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1065.00                             | -0.00                              | 5.80                     | 8.30                          | 2620.00              | 243.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1110.00                             | -0.00                              | 5.90                     | 8.40                          | 2341.00              | 210.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1233.00                             | -0.00                              | 9.10                     | 7.10                          | 2397.00              | 165.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1244.00                             | -0.00                              | 9.20                     | 7.00                          | 2341.00              | 163.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 8            | 1199.00                             | -0.00                              | 8.10                     | 7.00                          | 2452.00              | 173.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 1054.00                             | -0.00                              | 7.20                     | 7.40                          | 2620.00              | 239.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 673.00                              | -0.00                              | 8.80                     | 4.20                          | 42471.00             | 47.00               | -0.00                    | -0.00                    | 34.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1036.84                            | 273.05                             | 0.0                                 | 796.04                              | 0.12                               | 0.12                                | 4873.14                 | 1283.34                 | 0.0                      | 3741.39                  | 0.55                    | 0.55                     |
| 2            | 1137.71                            | 103.88                             | 0.0                                 | 1101.66                             | 0.37                               | 0.37                                | 9329.18                 | 851.84                  | 0.0                      | 9033.57                  | 3.03                    | 3.03                     |
| 3            | 824.19                             | 20.96                              | 0.0                                 | 1821.75                             | 8.67                               | 8.67                                | 25137.68                | 639.32                  | 0.0                      | 55563.50                 | 264.54                  | 264.54                   |
| 4            | 815.86                             | 21.11                              | 0.0                                 | 1834.44                             | 5.61                               | 5.61                                | 24883.68                | 643.77                  | 0.0                      | 55950.36                 | 171.24                  | 171.24                   |
| 5            | 820.10                             | 18.64                              | 0.0                                 | 1834.56                             | 4.79                               | 4.79                                | 25012.97                | 568.41                  | 0.0                      | 55954.01                 | 146.24                  | 146.24                   |
| 6            | 1118.28                            | 16.87                              | 0.0                                 | 1370.90                             | 3.33                               | 3.33                                | 104894.31               | 1582.43                 | 0.0                      | 128589.88                | 312.40                  | 312.40                   |
| 7            | 1130.95                            | 16.48                              | 0.0                                 | 1352.05                             | 3.29                               | 3.29                                | 79505.81                | 1158.66                 | 0.0                      | 95048.88                 | 231.38                  | 231.38                   |
| 8            | 1066.39                            | 18.49                              | 0.0                                 | 1447.99                             | 3.74                               | 3.74                                | 62490.20                | 1083.41                 | 0.0                      | 84852.13                 | 219.23                  | 219.23                   |
| 9            | 978.72                             | 20.40                              | 0.0                                 | 1580.50                             | 5.34                               | 5.34                                | 28676.38                | 597.64                  | 0.0                      | 46308.64                 | 156.35                  | 156.35                   |
| 10           | 1030.79                            | 284.92                             | 0.0                                 | 772.99                              | 0.90                               | 0.90                                | 8452.44                 | 2336.35                 | 0.0                      | 6338.50                  | 7.42                    | 7.42                     |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.20                           | 1.64                 | 1137.71                | 9329.18              | 1.866                  | 103.88                 | 851.84               | 0.170                  | 0.37                   | 3.03                 | 0.0006                 |
| 6                       | 0.30                    | 93.80                          | 0.47                 | 1118.28                | 104894.31            | 0.524                  | 16.87                  | 1582.43              | 0.008                  | 3.33                   | 312.40               | 0.0016                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1130.95                | 79505.81             | 6.599                  | 16.48                  | 1158.66              | 0.096                  | 3.29                   | 231.38               | 0.0192                 |
| 9                       | 6.00                    | 29.30                          | 2.93                 | 978.72                 | 28676.38             | 2.868                  | 20.40                  | 597.64               | 0.060                  | 5.34                   | 156.35               | 0.0156                 |
| 10                      | 4.00                    | 8.20                           | 0.55                 | 1030.79                | 8452.44              | 0.566                  | 284.92                 | 2336.35              | 0.157                  | 0.90                   | 7.42                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 11.423               |                        |                      | 12.423                 |                        |                      | 0.491                  |                        |                      | 0.0375                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.088                  |                        |                      | 0.043                  |                        |                      | 0.0033                 |

DATE: 0/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 273 ENGINE TYPE AND MODEL: IO-360-A1A SERIAL NUMBER: L-2928-51AC

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 1024. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.18 FINISH 30.18

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 4.70                           | 33.00                         | 0.08473           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.20                           | 76.00                         | 0.07456           |
| RUN UP      |                 | 3            | -0.0          | 28.10                          | 344.00                        | 0.06968           |
| RUN UP-LEAN |                 | 4            | -0.0          | 28.10                          | 342.00                        | 0.06987           |
| RUN UP-RICH |                 | 5            | -0.0          | 27.00                          | 333.00                        | 0.06990           |
| TAKE-OFF    |                 | 6            | -0.0          | 92.60                          | 1017.00                       | 0.07666           |
| CLIMB       |                 | 7            | -0.0          | 70.30                          | 793.00                        | 0.07493           |
| DESCENT     |                 | 8            | -0.0          | 50.40                          | 586.00                        | 0.07301           |
| APPROACH    |                 | 9            | -0.0          | 27.00                          | 315.00                        | 0.07067           |
| TAXI        |                 | 10           | -0.0          | 9.40                           | 81.00                         | 0.08042           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 504.00                              | -0.00                              | 7.50                     | 4.50                          | 60115.00             | 48.00               | -0.00                    | -0.00                    | 44.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 7.60                     | 5.70                          | 26352.00             | 86.00               | -0.00                    | -0.00                    | 42.00              | -0.00 | -0.00        |
| 3            | 1065.00                             | -0.00                              | 6.10                     | 8.70                          | 3019.00              | 415.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1020.00                             | -0.00                              | 6.20                     | 8.60                          | 3349.00              | 253.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1087.00                             | -0.00                              | 6.00                     | 8.90                          | 2635.00              | 243.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1256.00                             | -0.00                              | 9.20                     | 7.00                          | 2690.00              | 137.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1256.00                             | -0.00                              | 8.50                     | 7.40                          | 2306.00              | 171.00              | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 8            | 1188.00                             | -0.00                              | 7.60                     | 7.90                          | 2580.00              | 281.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 1054.00                             | -0.00                              | 7.30                     | 7.70                          | 2416.00              | 258.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 10           | 695.00                              | -0.00                              | 9.00                     | 5.10                          | 30305.00             | 104.00              | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 841.23                             | 386.17                             | 0.0                                 | 793.05                              | 0.88                               | 0.88                                | 3953.77                 | 1815.01                 | 0.0                      | 3727.35                  | 4.16                    | 4.16                     |
| 2            | 963.51                             | 191.34                             | 0.0                                 | 1135.42                             | 1.79                               | 1.79                                | 7900.81                 | 1568.98                 | 0.0                      | 9310.46                  | 14.69                   | 14.69                    |
| 3            | 816.02                             | 23.13                              | 0.0                                 | 1828.64                             | 9.12                               | 9.12                                | 22930.11                | 649.96                  | 0.0                      | 51384.69                 | 256.24                  | 256.24                   |
| 4            | 827.59                             | 25.60                              | 0.0                                 | 1803.68                             | 5.55                               | 5.55                                | 23255.19                | 719.43                  | 0.0                      | 50683.33                 | 155.87                  | 155.87                   |
| 5            | 799.38                             | 20.11                              | 0.0                                 | 1863.08                             | 5.32                               | 5.32                                | 21583.27                | 542.87                  | 0.0                      | 50303.05                 | 143.58                  | 143.58                   |
| 6            | 1128.55                            | 18.90                              | 0.0                                 | 1349.18                             | 2.76                               | 2.76                                | 104504.06               | 1750.02                 | 0.0                      | 124934.25                | 255.61                  | 255.61                   |
| 7            | 1064.56                            | 16.54                              | 0.0                                 | 1456.20                             | 3.52                               | 3.52                                | 74838.56                | 1162.81                 | 0.0                      | 102370.81                | 247.30                  | 247.30                   |
| 8            | 974.35                             | 18.94                              | 0.0                                 | 1591.35                             | 5.92                               | 5.92                                | 49107.16                | 954.76                  | 0.0                      | 80204.00                 | 298.23                  | 298.23                   |
| 9            | 967.60                             | 18.34                              | 0.0                                 | 1603.62                             | 5.62                               | 5.62                                | 26125.09                | 495.20                  | 0.0                      | 43297.61                 | 151.66                  | 151.66                   |
| 10           | 1061.39                            | 204.69                             | 0.0                                 | 945.02                              | 2.01                               | 2.01                                | 9977.05                 | 1924.06                 | 0.0                      | 8883.17                  | 18.94                   | 18.94                    |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.20                           | 1.64                 | 963.51                 | 7900.81              | 1.580                  | 191.34                 | 1568.98              | 0.314                  | 1.79                   | 14.69                | 0.0029                 |
| 6                       | 0.30                    | 92.60                          | 0.46                 | 1128.55                | 104504.06            | 0.523                  | 18.90                  | 1750.02              | 0.009                  | 2.76                   | 255.61               | 0.0013                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 1064.56                | 74838.56             | 6.212                  | 16.54                  | 1162.81              | 0.097                  | 3.52                   | 247.30               | 0.0205                 |
| 9                       | 6.00                    | 27.00                          | 2.70                 | 967.60                 | 26125.09             | 2.613                  | 18.34                  | 495.20               | 0.050                  | 5.62                   | 151.66               | 0.0152                 |
| 10                      | 4.00                    | 9.40                           | 0.63                 | 1061.39                | 9977.05              | 0.668                  | 204.69                 | 1924.06              | 0.129                  | 2.01                   | 18.94                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 11.268               |                        |                      | 11.595                 |                        |                      | 0.597                  |                        |                      | 0.0412                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.029                  |                        |                      | 0.053                  |                        |                      | 0.0037                 |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 274 ENGINE TYPE AND MODEL: ID-360-A1A

SERIAL NUMBER: L-2829-51A0

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 1024. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 30.18 FINISH 30.18

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 8.20                           | 43.00                         | 0.10251           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.20                           | 57.00                         | 0.09377           |
| RUN UP      |                 | 3            | -0.0          | 28.10                          | 318.00                        | 0.07675           |
| RUN UP-LEAN |                 | 4            | -0.0          | 28.10                          | 316.00                        | 0.07749           |
| RUN UP-RICH |                 | 5            | -0.0          | 29.30                          | 331.00                        | 0.07604           |
| TAKE-OFF    |                 | 6            | -0.0          | 94.90                          | 991.00                        | 0.08252           |
| CLIMB       |                 | 7            | -0.0          | 85.60                          | 900.00                        | 0.08106           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.08369           |
| APPROACH    |                 | 9            | -0.0          | 27.00                          | 310.00                        | 0.06821           |
| TAXI        |                 | 10           | -0.0          | 8.20                           | 56.00                         | 0.08597           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 538.00                              | -0.00                              | 8.50                     | 3.20                          | 99541.00             | 9.00                | -0.00                    | -0.00                    | 43.00              | -0.00 | -0.00        |
| 2            | 617.00                              | -0.00                              | 9.90                     | 4.10                          | 58782.00             | 14.00               | -0.00                    | -0.00                    | 60.00              | -0.00 | -0.00        |
| 3            | 1031.00                             | -0.00                              | 8.50                     | 7.60                          | 4381.00              | 154.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 986.00                              | -0.00                              | 8.70                     | 7.50                          | 4880.00              | 108.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1009.00                             | -0.00                              | 8.50                     | 7.50                          | 3771.00              | 95.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1211.00                             | -0.00                              | 10.90                    | 6.50                          | 2773.00              | 74.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1222.00                             | -0.00                              | 10.60                    | 6.50                          | 2662.00              | 73.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 8            | 1188.00                             | -0.00                              | 11.60                    | 6.00                          | 2828.00              | 51.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1031.00                             | -0.00                              | 7.30                     | 7.10                          | 2717.00              | 208.00              | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 10           | 673.00                              | -0.00                              | 9.10                     | 3.60                          | 54900.00             | 20.00               | -0.00                    | -0.00                    | 34.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 793.01                             | 531.87                             | 0.0                                 | 469.08                              | 0.14                               | 0.14                                | 6502.71                 | 4361.37                 | 0.0                      | 3846.43                  | 1.13                    | 1.13                     |
| 2            | 1006.14                            | 342.15                             | 0.0                                 | 454.71                              | 0.23                               | 0.23                                | 8250.38                 | 2805.62                 | 0.0                      | 5368.59                  | 1.92                    | 1.92                     |
| 3            | 1038.33                            | 30.65                              | 0.0                                 | 1458.71                             | 3.09                               | 3.09                                | 29177.05                | 861.27                  | 0.0                      | 40989.62                 | 86.43                   | 86.83                    |
| 4            | 1053.21                            | 33.83                              | 0.0                                 | 1426.58                             | 2.15                               | 2.15                                | 29595.32                | 950.75                  | 0.0                      | 40086.96                 | 60.35                   | 60.35                    |
| 5            | 1048.54                            | 26.64                              | 0.0                                 | 1453.67                             | 1.92                               | 1.92                                | 30722.12                | 780.61                  | 0.0                      | 42592.36                 | 56.40                   | 56.40                    |
| 6            | 1245.70                            | 18.15                              | 0.0                                 | 1167.18                             | 1.39                               | 1.39                                | 118216.56               | 1722.45                 | 0.0                      | 110765.25                | 131.83                  | 131.83                   |
| 7            | 1233.11                            | 17.74                              | 0.0                                 | 1188.09                             | 1.39                               | 1.39                                | 105554.31               | 1518.18                 | 0.0                      | 101700.25                | 119.40                  | 119.40                   |
| 8            | 1310.46                            | 18.30                              | 0.0                                 | 1065.02                             | 0.95                               | 0.95                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 9            | 1005.18                            | 21.43                              | 0.0                                 | 1536.04                             | 4.70                               | 4.70                                | 27139.89                | 578.52                  | 0.0                      | 41474.53                 | 127.02                  | 127.02                   |
| 10           | 1010.67                            | 349.21                             | 0.0                                 | 628.22                              | 0.36                               | 0.36                                | 8287.52                 | 2863.52                 | 0.0                      | 5151.38                  | 2.99                    | 2.99                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MOOF<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.20                           | 1.64                 | 1006.14                | 8250.38              | 1.650                  | 342.15                 | 2805.62              | 0.561                  | 0.23                   | 1.92                 | 0.0004                 |
| 6                       | 0.30                    | 94.90                          | 0.47                 | 1245.70                | 118216.56            | 0.591                  | 18.15                  | 1722.45              | 0.009                  | 1.39                   | 131.83               | 0.0007                 |
| 7                       | 5.00                    | 85.60                          | 7.10                 | 1233.11                | 105554.31            | 8.761                  | 17.74                  | 1518.18              | 0.126                  | 1.39                   | 119.40               | 0.0099                 |
| 9                       | 6.00                    | 27.00                          | 2.70                 | 1005.18                | 27139.89             | 2.714                  | 21.43                  | 578.52               | 0.058                  | 4.70                   | 127.02               | 0.0127                 |
| 10                      | 4.00                    | 8.20                           | 0.55                 | 1010.67                | 8287.52              | 0.555                  | 349.21                 | 2863.52              | 0.192                  | 0.36                   | 2.99                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 12.469               |                        |                      | 14.271                 |                        |                      | 0.945                  |                        |                      | 0.0239                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.145                  |                        |                      | 0.076                  |                        |                      | 0.0019                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 178 ENGINE TYPE AND MODEL: IO-360-A186 SERIAL NUMBER: L-7682-514A

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 660. HRS

FUEL: AV GAS 80/87 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 90.50

ATMOSPHERIC PRESSURE: START 30.13 FINISH 30.13

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 59.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 22.30                          | 201.00                        | 0.05868           |
| IDLE/TAXI   |                 | 2            | -0.0          | 23.40                          | 225.00                        | 0.07278           |
| RUN UP      |                 | 3            | -0.0          | 36.30                          | 347.00                        | 0.09503           |
| RUN UP-LEAN |                 | 4            | -0.0          | 37.50                          | 361.00                        | 0.08810           |
| RUN UP-RICH |                 | 5            | -0.0          | 36.30                          | 348.00                        | 0.08537           |
| TAKE-OFF    |                 | 6            | -0.0          | 85.60                          | 945.00                        | 0.08756           |
| CLIMB       |                 | 7            | -0.0          | 82.00                          | 893.00                        | 0.08850           |
| DESCENT     |                 | 8            | -0.0          | 64.50                          | 697.00                        | 0.08761           |
| APPROACH    |                 | 9            | -0.0          | 44.50                          | 424.00                        | 0.09458           |
| TAXI        |                 | 10           | -0.0          | 21.10                          | 195.00                        | 0.06253           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 415.00                              | -0.00                              | 8.40                     | 3.20                          | 7958.00              | 12.00               | -0.00                    | -0.00                    | 86.00              | -0.00 | -0.00        |
| 2            | 471.00                              | -0.00                              | 10.00                    | 4.70                          | 7706.00              | 3.00                | -0.00                    | -0.00                    | 73.00              | -0.00 | -0.00        |
| 3            | 762.00                              | -0.00                              | 13.90                    | 5.80                          | 5691.00              | 12.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 717.00                              | -0.00                              | 12.60                    | 5.60                          | 5843.00              | 12.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 785.00                              | -0.00                              | 12.30                    | 5.30                          | 5792.00              | 7.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1099.00                             | -0.00                              | 10.30                    | 8.20                          | 4029.00              | 140.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1166.00                             | -0.00                              | 10.80                    | 7.90                          | 3778.00              | 97.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1132.00                             | -0.00                              | 10.80                    | 7.70                          | 3677.00              | 95.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 953.00                              | -0.00                              | 14.00                    | 5.70                          | 4634.00              | 23.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 10           | 527.00                              | -0.00                              | 9.00                     | 3.60                          | 6296.00              | 6.30                | -0.00                    | -0.00                    | 79.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1369.01                            | 74.28                              | 0.0                                 | 819.44                              | 0.32                               | 0.32                                | 30528.90                | 1656.46                 | 0.0                      | 18273.42                 | 7.16                    | 7.16                     |
| 2            | 1305.85                            | 57.63                              | 0.0                                 | 964.34                              | 0.06                               | 0.06                                | 30556.97                | 1348.60                 | 0.0                      | 22565.58                 | 1.51                    | 1.51                     |
| 3            | 1385.42                            | 32.49                              | 0.0                                 | 908.31                              | 0.20                               | 0.20                                | 50290.82                | 1179.25                 | 0.0                      | 32971.62                 | 7.13                    | 7.13                     |
| 4            | 1355.12                            | 35.99                              | 0.0                                 | 946.31                              | 0.21                               | 0.21                                | 50816.97                | 1349.64                 | 0.0                      | 35486.63                 | 7.95                    | 7.95                     |
| 5            | 1366.89                            | 36.86                              | 0.0                                 | 925.43                              | 0.13                               | 0.13                                | 49617.92                | 1338.16                 | 0.0                      | 33592.91                 | 4.64                    | 4.64                     |
| 6            | 1100.81                            | 24.66                              | 0.0                                 | 1376.97                             | 2.46                               | 2.46                                | 94228.88                | 2111.00                 | 0.0                      | 117868.81                | 210.38                  | 210.38                   |
| 7            | 1143.66                            | 22.91                              | 0.0                                 | 1314.43                             | 1.69                               | 1.69                                | 93780.19                | 1878.86                 | 0.0                      | 107783.56                | 138.35                  | 138.35                   |
| 8            | 1156.40                            | 22.55                              | 0.0                                 | 1295.42                             | 1.67                               | 1.67                                | 74587.50                | 1454.39                 | 0.0                      | 83554.81                 | 107.77                  | 107.77                   |
| 9            | 1402.71                            | 26.59                              | 0.0                                 | 897.33                              | 0.38                               | 0.38                                | 62420.42                | 1183.31                 | 0.0                      | 39931.14                 | 16.84                   | 16.84                    |
| 10           | 1374.35                            | 55.06                              | 0.0                                 | 863.77                              | 0.15                               | 0.15                                | 28998.79                | 1161.84                 | 0.0                      | 18225.43                 | 3.18                    | 3.18                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 23.40                          | 4.68                 | 1305.85                | 30556.97             | 6.111                  | 57.63                  | 1348.60              | 0.270                  | 0.06                   | 1.51                 | 0.0003                 |
| 6                       | 0.30                    | 85.60                          | 0.43                 | 1100.81                | 94228.88             | 0.471                  | 24.66                  | 2111.00              | 0.011                  | 2.46                   | 210.38               | 0.0011                 |
| 7                       | 5.00                    | 82.00                          | 6.81                 | 1143.66                | 93780.19             | 7.784                  | 22.91                  | 1878.86              | 0.156                  | 1.69                   | 138.35               | 0.0115                 |
| 9                       | 6.00                    | 44.50                          | 4.45                 | 1402.71                | 62420.42             | 6.242                  | 26.59                  | 1183.31              | 0.118                  | 0.38                   | 16.84                | 0.0017                 |
| 10                      | 4.00                    | 21.10                          | 1.41                 | 1374.35                | 28998.79             | 1.943                  | 55.06                  | 1161.84              | 0.078                  | 0.15                   | 3.18                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 17.778               |                        |                      | 22.551                 |                        |                      | 0.632                  |                        |                      | 0.0147                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.269                  |                        |                      | 0.036                  |                        |                      | 0.0008                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL IO NUMBER: 179 ENGINE TYPE AND MODEL: IO-360-A1B6 SERIAL NUMBER: L-7682-51AB  
RATED HORSEPOWER: 200.  
ENGINE TOTAL TIME: 663. HRS  
FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPRATURE, DEGREES F: START 89.00 FINISH 89.00  
ATMOSPHERIC PRESSURE: START 30.12 FINISH 30.12  
INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02  
RELATIVE HUMIDITY: 59.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 14.10                          | 136.00                        | 0.04283           |
| IDLE/TAXI   |                 | 2            | -0.0          | 14.10                          | 144.00                        | 0.05500           |
| RUN UP      |                 | 3            | -0.0          | 34.00                          | 321.00                        | 0.08228           |
| RUN UP-LEAN |                 | 4            | -0.0          | 34.00                          | 324.00                        | 0.07196           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.00                          | 329.00                        | 0.07224           |
| CLIMB       |                 | 7            | -0.0          | 79.00                          | 1050.00                       | 0.08353           |
| DESCENT     |                 | 8            | -0.0          | 66.80                          | 735.00                        | 0.08250           |
| APPROACH    |                 | 9            | -0.0          | 44.50                          | 440.00                        | 0.08918           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 133.00                        | 0.05960           |
| TAKE-OFF    |                 | 6            | -0.0          | 96.10                          | -0.00                         | 0.08127           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 303.00                              | -0.00                              | 5.30                     | 3.00                          | 7514.00              | 27.00               | -0.00                    | -0.00                    | 90.00              | -0.00 | -0.00        |
| 2            | 404.00                              | -0.00                              | 6.40                     | 4.50                          | 7969.00              | 39.00               | -0.00                    | -0.00                    | 53.00              | -0.00 | -0.00        |
| 3            | 717.00                              | -0.00                              | 11.80                    | 5.00                          | 7008.00              | 15.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 650.00                              | -0.00                              | 10.10                    | 4.50                          | 6806.00              | 10.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 740.00                              | -0.00                              | 10.00                    | 4.70                          | 6553.00              | 12.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1177.00                             | -0.00                              | 10.00                    | 7.60                          | 3870.00              | 115.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 8            | 1155.00                             | -0.00                              | 9.80                     | 7.60                          | 3668.00              | 115.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 964.00                              | -0.00                              | 12.60                    | 6.00                          | 4478.00              | 35.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 538.00                              | -0.00                              | 8.30                     | 3.70                          | 6198.00              | 14.00               | -0.00                    | -0.00                    | 79.00              | -0.00 | -0.00        |
| 6            | 1130.00                             | -0.00                              | 9.00                     | 8.10                          | 4470.00              | 155.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1182.94                            | 96.05                              | 0.0                                 | 1052.07                             | 0.99                               | 0.99                                | 16679.41                | 1354.32                 | 0.0                      | 14834.22                 | 13.96                   | 13.96                    |
| 2            | 1105.38                            | 78.83                              | 0.0                                 | 1221.19                             | 1.11                               | 1.11                                | 15585.84                | 1111.47                 | 0.0                      | 17218.72                 | 15.60                   | 15.60                    |
| 3            | 1362.15                            | 46.33                              | 0.0                                 | 906.89                              | 0.28                               | 0.28                                | 46313.20                | 1575.30                 | 0.0                      | 30834.07                 | 9.67                    | 9.67                     |
| 4            | 1335.31                            | 51.53                              | 0.0                                 | 934.79                              | 0.22                               | 0.22                                | 45400.62                | 1752.18                 | 0.0                      | 31752.71                 | 7.38                    | 7.38                     |
| 5            | 1315.66                            | 49.38                              | 0.0                                 | 971.58                              | 0.26                               | 0.26                                | 44732.42                | 1678.83                 | 0.0                      | 33013.80                 | 8.82                    | 8.82                     |
| 7            | 1123.16                            | 24.89                              | 0.0                                 | 1341.20                             | 2.12                               | 2.12                                | 88729.94                | 1966.65                 | 0.0                      | 105955.06                | 167.61                  | 167.61                   |
| 8            | 1114.34                            | 23.89                              | 0.0                                 | 1357.83                             | 2.15                               | 2.15                                | 74438.00                | 1595.67                 | 0.0                      | 90702.69                 | 143.48                  | 143.48                   |
| 9            | 1336.37                            | 27.20                              | 0.0                                 | 999.88                              | 0.61                               | 0.61                                | 59468.54                | 1210.45                 | 0.0                      | 44494.52                 | 27.13                   | 27.13                    |
| 10           | 1328.70                            | 56.83                              | 0.0                                 | 930.66                              | 0.37                               | 0.37                                | 18734.68                | 801.24                  | 0.0                      | 13122.26                 | 5.19                    | 5.19                     |
| 6            | 1036.20                            | 29.47                              | 0.0                                 | 1465.29                             | 2.93                               | 2.93                                | 99578.25                | 2832.53                 | 0.0                      | 140813.88                | 281.69                  | 281.69                   |

LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 14.10                          | 2.87                 | 1105.38                | 15585.84             | 3.117                  | 78.83                  | 1111.47              | 0.222                  | 1.11                   | 15.60                | 0.0031                 |
| 6                       | 0.30                    | 96.10                          | 0.48                 | 1016.20                | 99578.25             | 0.498                  | 29.47                  | 2832.53              | 0.014                  | 2.93                   | 281.69               | 0.0014                 |
| 7                       | 5.00                    | 79.00                          | 6.56                 | 1123.16                | 88729.94             | 7.365                  | 24.89                  | 1966.65              | 0.163                  | 2.12                   | 167.61               | 0.0139                 |
| 9                       | 6.00                    | 44.50                          | 4.45                 | 1336.37                | 59468.54             | 5.947                  | 27.20                  | 1210.45              | 0.121                  | 0.61                   | 27.13                | 0.0027                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 1328.70                | 18734.68             | 1.255                  | 56.83                  | 801.24               | 0.054                  | 0.37                   | 5.19                 | 0.0003                 |
| TOTAL FOR CYCLE         |                         |                                | 15.252               |                        |                      | 18.182                 |                        |                      | 0.574                  |                        |                      | 0.0215                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.192                  |                        |                      | 0.038                  |                        |                      | 0.0014                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 180 ENGINE TYPE AND MODEL: IO-360-A186 SERIAL NUMBER: L-7682-91AC

RATED HORSEPOWER: 200.

ENGINE TOTAL TIME: 666. HRS

FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 30.11 FINISH 30.11

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 14.10                          | 147.00                        | 0.04396           |
| IDLE/TAXI   |                 | 2            | -0.0          | 14.10                          | 129.00                        | 0.05990           |
| RUN UP      |                 | 3            | -0.0          | 34.00                          | 336.00                        | 0.07873           |
| RUN UP-LEAN |                 | 4            | -0.0          | 4.00                           | 339.00                        | 0.07361           |
| RUN UP-RICH |                 | 5            | -0.0          | 32.80                          | 329.00                        | 0.07418           |
| TAKE-OFF    |                 | 6            | -0.0          | 85.60                          | 983.00                        | 0.07528           |
| CLIMB       |                 | 7            | -0.0          | 84.40                          | 924.00                        | 0.07785           |
| DESCENT     |                 | 8            | -0.0          | 66.80                          | 739.00                        | 0.07614           |
| APPROACH    |                 | 9            | -0.0          | 45.70                          | 459.00                        | 0.08064           |
| TAXI        |                 | 10           | -0.0          | 12.90                          | 119.00                        | 0.06034           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 325.00                              | -0.00                              | 6.00                     | 3.30                          | -0.00                | 15.00               | -0.00                    | -0.00                    | 53.00              | -0.00 | -0.00        |
| 2            | 415.00                              | -0.00                              | 6.50                     | 4.20                          | 20210.00             | 16.00               | -0.00                    | -0.00                    | 74.00              | -0.00 | -0.00        |
| 3            | 751.00                              | -0.00                              | 10.80                    | 5.40                          | 5826.00              | 22.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 695.00                              | -0.00                              | 9.90                     | 5.20                          | 5826.00              | 18.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 807.00                              | -0.00                              | 10.00                    | 5.30                          | 5106.00              | 20.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1121.00                             | -0.00                              | 8.20                     | 7.80                          | 2373.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1155.00                             | -0.00                              | 9.50                     | 7.00                          | 2230.00              | 98.00               | -0.00                    | -0.00                    | 40.00              | -0.00 | -0.00        |
| 8            | 1143.00                             | -0.00                              | 9.00                     | 7.10                          | 2661.00              | 57.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 9            | 975.00                              | -0.00                              | 11.10                    | 5.70                          | 4100.00              | -0.00               | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |
| 10           | 516.00                              | -0.00                              | 6.60                     | 4.30                          | 19203.00             | 36.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1303.38                            | -0.00                              | 0.0                                 | 1126.34                             | 0.54                               | 0.54                                | 18377.61                | -0.00                   | 0.0                      | 15881.45                 | 7.55                    | 7.55                     |
| 2            | 1032.27                            | 183.82                             | 0.0                                 | 1048.02                             | 0.42                               | 0.42                                | 14555.02                | 2591.86                 | 0.0                      | 14777.03                 | 5.88                    | 5.88                     |
| 3            | 1300.07                            | 40.17                              | 0.0                                 | 1021.35                             | 0.43                               | 0.43                                | 44202.31                | 1365.64                 | 0.0                      | 34725.91                 | 14.79                   | 14.79                    |
| 4            | 1275.32                            | 42.98                              | 0.0                                 | 1052.51                             | 0.38                               | 0.38                                | 5101.27                 | 171.93                  | 0.0                      | 4210.03                  | 1.52                    | 1.52                     |
| 5            | 1277.77                            | 37.37                              | 0.0                                 | 1064.06                             | 0.42                               | 0.42                                | 41910.92                | 1225.61                 | 0.0                      | 34901.27                 | 13.77                   | 13.77                    |
| 6            | 1020.24                            | 16.91                              | 0.0                                 | 1524.83                             | -0.00                              | -0.00                               | 87332.38                | 1447.45                 | 0.0                      | 130525.19                | -0.00                   | -0.00                    |
| 7            | 1147.66                            | 15.43                              | 0.0                                 | 1328.69                             | 1.94                               | 1.94                                | 96861.94                | 1302.21                 | 0.0                      | 112141.44                | 164.13                  | 164.13                   |
| 8            | 1110.96                            | 18.81                              | 0.0                                 | 1377.06                             | 1.16                               | 1.16                                | 74212.19                | 1256.67                 | 0.0                      | 91987.56                 | 77.20                   | 77.20                    |
| 9            | 1303.00                            | 27.56                              | 0.0                                 | 1051.32                             | -0.00                              | -0.00                               | 59547.03                | 1259.70                 | 0.0                      | 48045.24                 | -0.00                   | -0.00                    |
| 10           | 1040.03                            | 173.31                             | 0.0                                 | 1064.66                             | 0.93                               | 0.93                                | 13416.44                | 2235.67                 | 0.0                      | 13734.10                 | 12.02                   | 12.02                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 14.10                          | 2.82                 | 1032.27                | 14555.02             | 2.911                  | 183.82                 | 2591.86              | 0.518                  | 0.42                   | 5.88                 | 0.0012                 |
| 6                       | 0.30                    | 85.60                          | 0.43                 | 1020.24                | 87332.38             | 0.437                  | 16.91                  | 1447.45              | 0.007                  | -0.00                  | -0.00                | -0.0000                |
| 7                       | 5.00                    | 84.40                          | 7.01                 | 1147.66                | 96861.94             | 8.040                  | 15.43                  | 1302.21              | 0.108                  | 1.94                   | 164.13               | 0.0136                 |
| 9                       | 6.00                    | 45.70                          | 4.57                 | 1303.00                | 59547.03             | 5.955                  | 27.56                  | 1259.70              | 0.126                  | -0.00                  | -0.00                | -0.0000                |
| 10                      | 4.00                    | 12.90                          | 0.86                 | 1040.03                | 13416.44             | 0.899                  | 173.31                 | 2235.67              | 0.150                  | 0.93                   | 12.02                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 15.687               |                        |                      | 18.241                 |                        |                      | 0.909                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.163                  |                        |                      | 0.058                  |                        |                      | -0.0000                |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 256 ENGINE TYPE AND MODEL: IO-360-B1E

SERIAL NUMBER: L-4035-51AA

RATED HORSEPOWER: 180.

ENGINE TOTAL TIME: 1179. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

ANALYSIS DONE ON FRONT EXHAUST.

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.30                          | 122.00                        | 0.07073           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.80                          | 182.00                        | 0.06348           |
| RUN UP      |                 | 3            | -0.0          | 28.10                          | 373.00                        | 0.05699           |
| RUN UP-LEAN |                 | 4            | -0.0          | 21.10                          | 279.00                        | 0.05781           |
| RUN UP-RICH |                 | 5            | -0.0          | 28.10                          | 372.00                        | 0.05729           |
| TAKE-OFF    |                 | 6            | -0.0          | 54.50                          | 639.00                        | 0.06415           |
| CLIMB       |                 | 7            | -0.0          | 43.90                          | 572.00                        | 0.05920           |
| DESCENT     |                 | 8            | -0.0          | 38.70                          | 516.00                        | 0.05634           |
| APPROACH    |                 | 9            | -0.0          | 28.10                          | 354.00                        | 0.06010           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 155.00                        | 0.06350           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 628.00                              | -0.00                              | 7.70                     | 5.80                          | 16217.00             | 10.00               | -0.00                    | -0.00                    | 35.00              | -0.00 | -0.00        |
| 2            | 695.00                              | -0.00                              | 6.50                     | 6.70                          | 4336.00              | 36.00               | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 3            | 1312.00                             | -0.00                              | 3.40                     | 8.80                          | 1689.00              | 627.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1300.00                             | -0.00                              | 3.50                     | 8.90                          | 1520.00              | 302.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1323.00                             | -0.00                              | 3.50                     | 8.80                          | 1351.00              | 302.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1401.00                             | -0.00                              | 6.50                     | 7.10                          | 2027.00              | 219.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1435.00                             | -0.00                              | 4.00                     | 8.70                          | 1408.00              | 769.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1401.00                             | -0.00                              | 3.20                     | 8.90                          | 1351.00              | 907.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 9            | 1256.00                             | -0.00                              | 4.70                     | 8.10                          | 1971.00              | 387.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 740.00                              | -0.00                              | 7.10                     | 5.90                          | 5856.00              | 30.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1028.71                            | 124.08                             | 0.0                                 | 1217.50                             | 0.22                               | 0.22                                | 12653.10                | 1526.24                 | 0.0                      | 14975.70                 | 2.70                    | 2.70                     |
| 2            | 963.17                             | 36.80                              | 0.0                                 | 1559.93                             | 0.88                               | 0.88                                | 15218.15                | 581.41                  | 0.0                      | 24646.83                 | 13.84                   | 13.84                    |
| 3            | 555.33                             | 15.80                              | 0.0                                 | 2258.35                             | 16.82                              | 16.82                               | 15604.71                | 443.97                  | 0.0                      | 63459.68                 | 472.68                  | 472.68                   |
| 4            | 563.32                             | 14.01                              | 0.0                                 | 2250.70                             | 7.98                               | 7.98                                | 11886.09                | 295.64                  | 0.0                      | 47489.70                 | 168.46                  | 168.46                   |
| 5            | 568.62                             | 12.57                              | 0.0                                 | 2246.33                             | 8.06                               | 8.06                                | 15978.15                | 353.23                  | 0.0                      | 63121.84                 | 226.46                  | 226.46                   |
| 6            | 951.37                             | 16.99                              | 0.0                                 | 1632.80                             | 5.27                               | 5.27                                | 51849.87                | 926.05                  | 0.0                      | 88987.81                 | 286.94                  | 286.94                   |
| 7            | 629.37                             | 12.69                              | 0.0                                 | 2150.64                             | 19.87                              | 19.87                               | 27627.01                | 556.96                  | 0.0                      | 94413.00                 | 872.41                  | 872.41                   |
| 8            | 528.38                             | 12.78                              | 0.0                                 | 2308.99                             | 24.60                              | 24.60                               | 20448.18                | 494.43                  | 0.0                      | 89358.00                 | 951.99                  | 951.99                   |
| 9            | 730.56                             | 17.55                              | 0.0                                 | 1978.24                             | 9.88                               | 9.88                                | 20528.59                | 493.05                  | 0.0                      | 55588.48                 | 277.65                  | 277.65                   |
| 10           | 1055.80                            | 49.87                              | 0.0                                 | 1378.52                             | 0.73                               | 0.73                                | 14886.77                | 703.22                  | 0.0                      | 19437.13                 | 10.33                   | 10.33                    |

## LTO CYCLE EMISSIONS

| TFST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.80                          | 3.16                 | 963.17                 | 15218.15             | 3.044                  | 36.80                  | 581.41               | 0.116                  | 0.88                   | 13.84                | 0.0028                 |
| 6                       | 0.30                    | 54.50                          | 0.27                 | 951.37                 | 51849.87             | 0.259                  | 16.99                  | 926.05               | 0.005                  | 5.27                   | 286.94               | 0.0014                 |
| 7                       | 5.00                    | 43.90                          | 3.64                 | 629.32                 | 27627.01             | 2.293                  | 12.69                  | 556.96               | 0.046                  | 19.87                  | 872.41               | 0.0724                 |
| 9                       | 6.00                    | 28.10                          | 2.81                 | 730.56                 | 20528.59             | 2.053                  | 17.55                  | 493.05               | 0.049                  | 9.88                   | 277.65               | 0.0278                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 1055.80                | 14886.77             | 0.997                  | 49.87                  | 703.22               | 0.047                  | 0.73                   | 10.33                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                | 10.831               |                        |                      | 8.646                  |                        |                      | 0.264                  |                        |                      | 0.1051                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.798                  |                        |                      | 0.024                  |                        |                      | 0.0097                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 257 ENGINE TYPE AND MODEL: IO-360-BIE SERIAL NUMBER: L-4835-51AB

RATED HORSEPOWER: 180.

ENGINE TOTAL TIME: 1180. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 38.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

ANALYSIS DONE ON FRONT EXHAUST.

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.30                          | 96.00                         | 0.06297           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.80                          | 170.00                        | 0.06147           |
| RUN UP      |                 | 3            | -0.0          | 29.90                          | 383.00                        | 0.05914           |
| RUN UP-LEAN |                 | 4            | -0.0          | 21.10                          | 273.00                        | 0.05942           |
| RUN UP-RICH |                 | 5            | -0.0          | 29.90                          | 384.00                        | 0.05983           |
| TAKE-OFF    |                 | 6            | -0.0          | 54.50                          | 643.00                        | 0.06554           |
| CLIMB       |                 | 7            | -0.0          | 43.90                          | 521.00                        | 0.06229           |
| DESCENT     |                 | 8            | -0.0          | 38.70                          | 469.00                        | 0.06124           |
| APPROACH    |                 | 9            | -0.0          | 28.10                          | 353.00                        | 0.05918           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 132.00                        | 0.07141           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 504.00                              | -0.00                              | 4.90                     | 4.20                          | 42822.00             | 17.00               | -0.00                    | -0.00                    | 28.00              | -0.00 | -0.00        |
| 2            | 650.00                              | -0.00                              | 5.50                     | 6.30                          | 13835.00             | 44.00               | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |
| 3            | 1247.00                             | -0.00                              | 4.20                     | 8.40                          | 2086.00              | 456.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1300.00                             | -0.00                              | 4.10                     | 8.60                          | 1812.00              | 237.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1312.00                             | -0.00                              | 4.30                     | 8.50                          | 1647.00              | 225.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1368.00                             | -0.00                              | 6.50                     | 7.40                          | 2196.00              | 245.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1356.00                             | -0.00                              | 6.10                     | 7.10                          | 2031.00              | 265.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1323.00                             | -0.00                              | 5.60                     | 7.40                          | 1976.00              | 314.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 1244.00                             | -0.00                              | 4.70                     | 7.90                          | 1867.00              | 372.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 785.00                              | -0.00                              | 8.90                     | 4.90                          | 13999.00             | 10.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 739.73                             | 370.24                             | 0.0                                 | 996.24                              | 0.42                               | 0.42                                | 9098.62                 | 4553.98                 | 0.0                      | 12253.69                 | 5.18                    | 5.18                     |
| 2            | 842.82                             | 121.42                             | 0.0                                 | 1516.88                             | 1.11                               | 1.11                                | 13316.52                | 1918.46                 | 0.0                      | 23966.63                 | 17.50                   | 17.50                    |
| 3            | 662.44                             | 18.84                              | 0.0                                 | 2081.70                             | 11.81                              | 11.81                               | 19807.08                | 563.42                  | 0.0                      | 62242.77                 | 353.23                  | 353.23                   |
| 4            | 643.03                             | 16.28                              | 0.0                                 | 2119.25                             | 6.11                               | 6.11                                | 13567.86                | 343.42                  | 0.0                      | 44716.15                 | 128.82                  | 128.82                   |
| 5            | 670.05                             | 14.70                              | 0.0                                 | 2081.12                             | 5.76                               | 5.76                                | 20034.50                | 439.49                  | 0.0                      | 62225.37                 | 172.19                  | 172.19                   |
| 6            | 930.02                             | 18.00                              | 0.0                                 | 1663.60                             | 5.76                               | 5.76                                | 50686.14                | 980.74                  | 0.0                      | 90666.25                 | 313.81                  | 313.81                   |
| 7            | 919.45                             | 17.53                              | 0.0                                 | 1681.49                             | 6.56                               | 6.56                                | 40363.69                | 769.69                  | 0.0                      | 73817.19                 | 288.02                  | 288.02                   |
| 8            | 857.23                             | 17.32                              | 0.0                                 | 1779.82                             | 7.90                               | 7.90                                | 33174.61                | 670.42                  | 0.0                      | 68879.13                 | 305.54                  | 305.54                   |
| 9            | 742.58                             | 16.89                              | 0.0                                 | 1961.14                             | 9.65                               | 9.65                                | 20866.39                | 474.72                  | 0.0                      | 99108.03                 | 271.28                  | 271.28                   |
| 10           | 1182.91                            | 106.56                             | 0.0                                 | 1023.28                             | 0.22                               | 0.22                                | 16679.00                | 1502.53                 | 0.0                      | 14428.23                 | 3.08                    | 3.08                     |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.80                          | 3.16                 | 842.82                 | 13316.52             | 2.663                  | 121.42                 | 1918.46              | 0.384                  | 1.11                   | 17.50                | 0.0035                 |
| 6                       | 0.30                    | 54.50                          | 0.27                 | 930.02                 | 50686.14             | 0.253                  | 18.00                  | 980.74               | 0.005                  | 5.76                   | 313.81               | 0.0016                 |
| 7                       | 5.00                    | 43.90                          | 3.64                 | 919.45                 | 40363.69             | 3.350                  | 17.53                  | 769.69               | 0.064                  | 6.56                   | 288.02               | 0.0239                 |
| 9                       | 6.00                    | 28.10                          | 2.81                 | 742.58                 | 20866.39             | 2.087                  | 16.89                  | 474.72               | 0.047                  | 9.65                   | 271.28               | 0.0271                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 1182.91                | 16679.00             | 1.117                  | 106.56                 | 1502.53              | 0.101                  | 0.22                   | 3.08                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 10.831               |                        |                      | 9.471                  |                        |                      | 0.601                  |                        |                      | 0.0563                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.874                  |                        |                      | 0.055                  |                        |                      | 0.0052                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 250 ENGINE TYPE AND MODEL: ID-360-B1E SERIAL NUMBER: L-4835-51AC

RATED HORSEPOWER: 180.

ENGINE TOTAL TIME: 1180. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 36.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

ANALYSIS DONE ON REAR EXHAUST.

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.30                          | 95.00                         | 0.07571           |
| IDLE/TAXI   |                 | 2            | -0.0          | 14.10                          | 144.00                        | 0.06759           |
| RUN UP      |                 | 3            | -0.0          | 29.90                          | 354.00                        | 0.06161           |
| RUN UP-LEAN |                 | 4            | -0.0          | 19.30                          | 229.00                        | 0.06236           |
| RUN UP-RICH |                 | 5            | -0.0          | 28.10                          | 333.00                        | 0.06236           |
| TAK-OFF     |                 | 6            | -0.0          | 56.30                          | 648.00                        | 0.06482           |
| CLIMB       |                 | 7            | -0.0          | 43.90                          | 497.00                        | 0.06543           |
| DESCENT     |                 | 8            | -0.0          | 38.70                          | 440.00                        | 0.06447           |
| APPROACH    |                 | 9            | -0.0          | 28.10                          | 316.00                        | 0.06328           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 113.00                        | 0.07777           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 594.00                              | -0.00                              | 8.20                     | 4.00                          | 38540.00             | 5.00                | -0.00                    | -0.00                    | 26.00              | -0.00 | -0.00        |
| 2            | 650.00                              | -0.00                              | 7.50                     | 5.80                          | 11529.00             | 27.00               | -0.00                    | -0.00                    | 31.00              | -0.00 | -0.00        |
| 3            | 1166.00                             | -0.00                              | 6.00                     | 7.00                          | 2525.00              | 170.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1143.00                             | -0.00                              | 6.10                     | 7.10                          | 2196.00              | 97.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1188.00                             | -0.00                              | 6.10                     | 7.10                          | 2196.00              | 97.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1345.00                             | -0.00                              | 6.90                     | 6.80                          | 2251.00              | 159.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1267.00                             | -0.00                              | 7.20                     | 6.60                          | 2416.00              | 144.00              | -0.00                    | -0.00                    | 11.00              | -0.70 | -0.00        |
| 8            | 1222.00                             | -0.00                              | 7.10                     | 6.50                          | 2306.00              | 150.00              | -0.00                    | -0.00                    | 7.00               | -0.70 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 7.10                     | 6.20                          | 2580.00              | 116.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 10           | 762.00                              | -0.00                              | 9.70                     | 4.30                          | 25034.00             | 6.00                | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1031.89                            | 277.76                             | 0.0                                 | 790.89                              | 0.10                               | 0.10                                | 12692.21                | 3416.49                 | 0.0                      | 9727.96                  | 1.27                    | 1.27                     |
| 2            | 1048.35                            | 92.30                              | 0.0                                 | 1273.84                             | 0.62                               | 0.62                                | 14781.80                | 1301.38                 | 0.0                      | 17961.06                 | 8.74                    | 8.74                     |
| 3            | 914.65                             | 22.05                              | 0.0                                 | 1676.64                             | 4.26                               | 4.26                                | 27348.05                | 659.15                  | 0.0                      | 50131.57                 | 127.28                  | 127.28                   |
| 4            | 918.32                             | 18.93                              | 0.0                                 | 1679.42                             | 2.40                               | 2.40                                | 17723.48                | 365.42                  | 0.0                      | 32412.75                 | 46.29                   | 46.29                    |
| 5            | 918.32                             | 18.93                              | 0.0                                 | 1679.42                             | 2.40                               | 2.40                                | 25804.67                | 532.04                  | 0.0                      | 47191.62                 | 67.40                   | 67.40                    |
| 6            | 1001.04                            | 18.70                              | 0.0                                 | 1550.07                             | 3.79                               | 3.79                                | 56358.69                | 1053.01                 | 0.0                      | 87268.75                 | 213.32                  | 213.32                   |
| 7            | 1035.90                            | 19.91                              | 0.0                                 | 1492.00                             | 3.40                               | 3.40                                | 45475.98                | 873.96                  | 0.0                      | 65498.59                 | 149.39                  | 149.39                   |
| 8            | 1037.10                            | 19.29                              | 0.0                                 | 1491.81                             | 3.60                               | 3.60                                | 40135.62                | 746.58                  | 0.0                      | 57732.91                 | 139.28                  | 139.28                   |
| 9            | 1057.95                            | 22.02                              | 0.0                                 | 1451.56                             | 2.84                               | 2.84                                | 29728.33                | 618.70                  | 0.0                      | 40788.94                 | 79.78                   | 79.78                    |
| 10           | 1187.41                            | 175.51                             | 0.0                                 | 827.06                              | 0.12                               | 0.12                                | 16742.45                | 2474.70                 | 0.0                      | 11661.49                 | 1.70                    | 1.70                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 14.10                          | 2.82                 | 1048.35                | 14781.80             | 2.956                  | 92.30                  | 1301.38              | 0.260                  | 0.62                   | 8.74                 | 0.0017                 |
| 6                       | 0.30                    | 56.30                          | 0.28                 | 1001.04                | 56358.69             | 0.282                  | 18.70                  | 1053.01              | 0.005                  | 3.79                   | 213.32               | 0.0011                 |
| 7                       | 5.00                    | 43.90                          | 3.64                 | 1035.90                | 45475.98             | 3.775                  | 19.91                  | 873.96               | 0.073                  | 3.40                   | 149.39               | 0.0124                 |
| 9                       | 6.00                    | 28.10                          | 2.81                 | 1057.95                | 29728.33             | 2.973                  | 22.02                  | 618.70               | 0.062                  | 2.84                   | 79.78                | 0.0080                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 1187.41                | 16742.45             | 1.122                  | 175.51                 | 2474.70              | 0.166                  | 0.12                   | 1.70                 | 0.0001                 |
| TOTAL FOR CYCLE         |                         |                                | 10.500               |                        |                      | 11.107                 |                        |                      | 0.566                  |                        |                      | 0.0233                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.058                  |                        |                      | 0.054                  |                        |                      | 0.0022                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 196 ENGINE TYPE AND MODEL: IO-360-C

SERIAL NUMBER: F/51634-70CA

RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 169. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 16.40                          | 145.00                        | 0.06097           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.30                          | 212.00                        | 0.05909           |
| RUN UP      |                 | 3            | -0.0          | 23.40                          | 266.00                        | 0.07676           |
| RUN UP-LEAN |                 | 4            | -0.0          | 19.90                          | 228.00                        | 0.06964           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.30                          | 257.00                        | 0.07304           |
| TAKE-OFF    |                 | 6            | -0.0          | 109.00                         | 1221.00                       | 0.07945           |
| CLIMB       |                 | 7            | -0.0          | 73.80                          | 839.00                        | 0.08010           |
| DESCENT     |                 | 8            | -0.0          | 56.30                          | 630.00                        | 0.08112           |
| APPROACH    |                 | 9            | -0.0          | 41.00                          | 453.00                        | 0.08222           |
| TAXI        |                 | 10           | -0.0          | 23.40                          | 182.00                        | 0.06048           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 448.00                              | -0.00                              | 3.90                     | 5.30                          | 38264.00             | 11.00               | -0.00                    | -0.00                    | 51.00              | -0.00 | -0.00        |
| 2            | 471.00                              | -0.00                              | 3.40                     | 5.90                          | 33605.00             | 20.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 3            | 852.00                              | -0.00                              | 7.70                     | 8.10                          | 7819.00              | 134.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 740.00                              | -0.00                              | 6.60                     | 7.60                          | 8152.00              | 78.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 874.00                              | -0.00                              | 6.90                     | 8.10                          | 7819.00              | 98.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1222.00                             | -0.00                              | 8.50                     | 8.00                          | 6488.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1323.00                             | -0.00                              | 8.90                     | 8.10                          | 2939.00              | 228.00              | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 8            | 1256.00                             | -0.00                              | 9.40                     | 7.80                          | 2884.00              | 209.00              | -0.00                    | -0.00                    | 16.00              | -0.00 | -0.00        |
| 9            | 1143.00                             | -0.00                              | 9.60                     | 7.70                          | 4159.00              | 209.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 10           | 460.00                              | -0.00                              | 3.10                     | 4.70                          | 50907.00             | 14.00               | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 604.84                             | 339.87                             | 0.0                                 | 1291.49                             | 0.28                               | 0.28                                | 9919.40                 | 5573.87                 | 0.0                      | 21180.45                 | 4.60                    | 4.60                     |
| 2            | 542.54                             | 307.11                             | 0.0                                 | 1479.25                             | 0.52                               | 0.52                                | 12098.58                | 6848.65                 | 0.0                      | 32987.23                 | 11.69                   | 11.69                    |
| 3            | 938.12                             | 54.56                              | 0.0                                 | 1550.57                             | 2.68                               | 2.68                                | 21951.99                | 1276.67                 | 0.0                      | 36283.26                 | 62.75                   | 62.75                    |
| 4            | 888.00                             | 62.82                              | 0.0                                 | 1606.66                             | 1.72                               | 1.72                                | 17671.25                | 1250.07                 | 0.0                      | 31972.41                 | 34.30                   | 34.30                    |
| 5            | 883.27                             | 57.32                              | 0.0                                 | 1629.17                             | 2.06                               | 2.06                                | 19696.82                | 1278.33                 | 0.0                      | 36330.40                 | 45.95                   | 45.95                    |
| 6            | 1001.35                            | 43.77                              | 0.0                                 | 1480.80                             | -0.00                              | -0.00                               | 109147.38               | 4771.45                 | 0.0                      | 161407.13                | -0.00                   | -0.00                    |
| 7            | 1039.68                            | 19.66                              | 0.0                                 | 1486.73                             | 4.37                               | 4.37                                | 76728.19                | 1451.14                 | 0.0                      | 109720.63                | 322.86                  | 322.86                   |
| 8            | 1085.87                            | 19.08                              | 0.0                                 | 1415.74                             | 3.97                               | 3.97                                | 61134.72                | 1074.24                 | 0.0                      | 79706.31                 | 223.27                  | 223.27                   |
| 9            | 1094.74                            | 27.16                              | 0.0                                 | 1379.65                             | 3.91                               | 3.91                                | 44984.21                | 1113.67                 | 0.0                      | 56565.46                 | 160.51                  | 160.51                   |
| 10           | 485.83                             | 456.93                             | 0.0                                 | 1157.34                             | 0.36                               | 0.36                                | 11368.48                | 10692.12                | 0.0                      | 27081.77                 | 8.43                    | 8.43                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 22.30                          | 4.46                 | 542.54                 | 12098.58             | 2.420                  | 307.11                 | 6848.65              | 1.370                  | 0.52                   | 11.69                | 0.0023                 |
| 6                       | 0.30                    | 109.00                         | 0.54                 | 1001.35                | 109147.38            | 0.546                  | 43.77                  | 4771.45              | 0.024                  | -0.00                  | -0.00                | -0.0000                |
| 7                       | 5.00                    | 73.80                          | 6.13                 | 1039.68                | 76728.19             | 6.368                  | 19.66                  | 1451.14              | 0.120                  | 4.37                   | 322.86               | 0.0268                 |
| 9                       | 6.00                    | 41.00                          | 4.10                 | 1094.74                | 44884.21             | 4.488                  | 27.16                  | 1113.67              | 0.111                  | 3.91                   | 160.51               | 0.0161                 |
| 10                      | 4.00                    | 23.40                          | 1.57                 | 485.83                 | 11368.48             | 0.762                  | 456.93                 | 10692.12             | 0.716                  | 0.36                   | 8.43                 | 0.0006                 |
| TOTAL FOR CYCLE         |                         |                                | 16.798               |                        |                      | 14.584                 |                        |                      | 2.342                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.868                  |                        |                      | 0.139                  |                        |                      | -0.0000                |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 197 ENGINE TYPE AND MODEL: IO-360-C

SERIAL NUMBER: F/51634-70CB

RATED HHPSEPOWER: 210.

ENGINE TOTAL TIME: 169. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 30.13 FINISH 30.13

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 18.80                          | 103.00                        | 0.06883           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.30                          | 151.00                        | 0.06851           |
| RUN UP      |                 | 3            | -0.0          | 24.60                          | 298.00                        | 0.06904           |
| RUN UP-LFAN |                 | 4            | -0.0          | 19.90                          | 237.00                        | 0.07796           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.30                          | 265.00                        | 0.07508           |
| TAKE-OFF    |                 | 6            | -0.0          | 106.70                         | 1227.00                       | 0.07928           |
| CLIMB       |                 | 7            | -0.0          | 78.50                          | 904.00                        | 0.07998           |
| DESCENT     |                 | 8            | -0.0          | 59.80                          | 668.00                        | 0.08212           |
| APPROACH    |                 | 9            | -0.0          | 38.70                          | 418.00                        | 0.08367           |
| TAXI        |                 | 10           | -0.0          | 24.60                          | 188.00                        | 0.06220           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 269.00                              | -0.00                              | 3.90                     | 3.00                          | 76527.00             | 5.00                | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 2            | 348.00                              | -0.00                              | 3.70                     | 4.30                          | 65714.00             | 14.00               | -0.00                    | -0.00                    | 31.00              | -0.00 | -0.00        |
| 3            | 740.00                              | -0.00                              | 5.60                     | 8.70                          | 6655.00              | 89.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 650.00                              | -0.00                              | 6.80                     | 9.40                          | 7431.00              | 167.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 785.00                              | -0.00                              | 6.50                     | 9.10                          | 6987.00              | 137.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1244.00                             | -0.00                              | 8.30                     | 8.40                          | 4436.00              | 238.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1334.00                             | -0.00                              | 8.60                     | 8.40                          | 2939.00              | 233.00              | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 9.50                     | 7.90                          | 3105.00              | 184.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1099.00                             | -0.00                              | 9.90                     | 7.50                          | 4100.00              | 164.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 10           | 549.00                              | -0.00                              | 3.20                     | 4.70                          | 53569.00             | 14.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 541.41                             | 608.44                             | 0.0                                 | 654.36                              | 0.11                               | 0.11                                | 10178.42                | 11438.67                | 0.0                      | 12302.00                 | 2.14                    | 2.14                     |
| 2            | 512.98                             | 521.80                             | 0.0                                 | 936.71                              | 0.32                               | 0.32                                | 11439.49                | 11636.12                | 0.0                      | 20888.71                 | 7.11                    | 7.11                     |
| 3            | 755.96                             | 51.45                              | 0.0                                 | 1845.31                             | 1.97                               | 1.97                                | 18596.60                | 1265.72                 | 0.0                      | 45394.48                 | 48.55                   | 48.55                    |
| 4            | 810.81                             | 50.75                              | 0.0                                 | 1761.06                             | 3.27                               | 3.27                                | 16135.05                | 1009.84                 | 0.0                      | 35045.15                 | 65.09                   | 65.09                    |
| 5            | 805.68                             | 49.60                              | 0.0                                 | 1772.26                             | 2.79                               | 2.79                                | 17966.61                | 1106.09                 | 0.0                      | 39521.47                 | 62.20                   | 62.20                    |
| 6            | 978.09                             | 29.94                              | 0.0                                 | 1555.31                             | 4.61                               | 4.61                                | 104361.94               | 3194.49                 | 0.0                      | 165951.63                | 491.54                  | 491.54                   |
| 7            | 1004.63                            | 19.66                              | 0.0                                 | 1541.79                             | 4.47                               | 4.47                                | 78863.63                | 1543.56                 | 0.0                      | 121030.75                | 350.96                  | 350.96                   |
| 8            | 1083.66                            | 20.29                              | 0.0                                 | 1415.91                             | 3.45                               | 3.45                                | 64803.08                | 1213.05                 | 0.0                      | 84671.50                 | 206.16                  | 206.16                   |
| 9            | 1110.51                            | 39.19                              | 0.0                                 | 1321.87                             | 3.02                               | 3.02                                | 42976.82                | 1516.61                 | 0.0                      | 51155.22                 | 116.94                  | 116.94                   |
| 10           | 487.65                             | 467.54                             | 0.0                                 | 1125.37                             | 0.35                               | 0.35                                | 11996.22                | 11501.48                | 0.0                      | 27684.13                 | 8.62                    | 8.62                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 22.30                          | 4.46                 | 512.98                 | 11439.49             | 2.288                  | 521.80                 | 11636.12             | 2.327                  | 0.32                   | 7.11                 | 0.0014                 |
| 6                       | 0.30            | 106.70                         | 0.53                 | 978.09                 | 104361.94            | 0.522                  | 29.94                  | 3194.49              | 0.016                  | 4.61                   | 491.54               | 0.0025                 |
| 7                       | 5.00            | 78.50                          | 6.52                 | 1004.63                | 78863.63             | 6.546                  | 19.66                  | 1543.56              | 0.128                  | 4.47                   | 350.96               | 0.0291                 |
| 9                       | 6.00            | 38.70                          | 3.87                 | 1110.51                | 42976.82             | 4.298                  | 39.19                  | 1516.61              | 0.152                  | 3.02                   | 116.94               | 0.0117                 |
| 10                      | 4.00            | 24.60                          | 1.65                 | 487.65                 | 11996.22             | 0.804                  | 467.54                 | 11501.48             | 0.771                  | 0.35                   | 8.62                 | 0.0006                 |
| TOTAL FOR CYCLE         |                 |                                | 17.027               |                        |                      | 14.457                 |                        |                      | 3.394                  |                        |                      | 0.0453                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 0.849                  |                        |                      | 0.149                  |                        |                      | 0.0027                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 198 ENGINE TYPE AND MODEL: 10-360-C SERIAL NUMBER: F/51634-70CC

RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 170. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 94.00 FINISH 94.00

ATMOSPHERIC PRESSURE: START 30.12 FINISH 30.12

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 46.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.90                          | 128.00                        | 0.06189           |
| IDLE/TAXI   |                 | 2            | -0.0          | 16.40                          | 165.00                        | 0.06401           |
| RUN UP      |                 | 3            | -0.0          | 24.60                          | 304.00                        | 0.07117           |
| RUN UP-LEAN |                 | 4            | -0.0          | 21.10                          | 253.00                        | 0.07436           |
| RUN UP-RICH |                 | 5            | -0.0          | 23.40                          | 284.00                        | 0.07491           |
| TAKE-OFF    |                 | 6            | -0.0          | 109.00                         | 1367.00                       | 0.08198           |
| CLIMB       |                 | 7            | -0.0          | 77.40                          | 897.00                        | 0.08026           |
| DESCENT     |                 | 8            | -0.0          | 59.80                          | 678.00                        | 0.08008           |
| APPROACH    |                 | 9            | -0.0          | 39.80                          | 451.00                        | 0.08031           |
| TAXI        |                 | 10           | -0.0          | 18.80                          | 172.00                        | 0.06820           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 381.00                              | -0.00                              | 3.50                     | 6.60                          | 32020.00             | 16.00               | -0.00                    | -0.00                    | 43.00              | -0.00 | -0.00        |
| 2            | 448.00                              | -0.00                              | 3.40                     | 7.20                          | 31937.00             | 33.00               | -0.00                    | -0.00                    | 45.00              | -0.00 | -0.00        |
| 3            | 773.00                              | -0.00                              | 5.90                     | 9.20                          | 3595.00              | 150.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 729.00                              | -0.00                              | 6.80                     | 8.90                          | 4264.00              | 208.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 807.00                              | -0.00                              | 6.80                     | 9.10                          | 3595.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1155.00                             | -0.00                              | 9.60                     | 7.70                          | 3651.00              | 170.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1312.00                             | -0.00                              | 8.50                     | 8.60                          | 2703.00              | 243.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1222.00                             | -0.00                              | 9.00                     | 8.00                          | 2815.00              | 203.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1099.00                             | -0.00                              | 9.00                     | 8.00                          | 3316.00              | 203.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 10           | 482.00                              | -0.00                              | 3.50                     | 6.70                          | 44645.00             | 19.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 531.56                             | 278.52                             | 0.0                                 | 1574.95                             | 0.40                               | 0.40                                | 6857.13                 | 3592.87                 | 0.0                      | 20316.86                 | 5.15                    | 5.15                     |
| 2            | 448.00                             | 267.89                             | 0.0                                 | 1656.88                             | 0.79                               | 0.79                                | 8166.64                 | 4393.43                 | 0.0                      | 27172.86                 | 13.02                   | 13.02                    |
| 3            | 771.01                             | 26.91                              | 0.0                                 | 1889.00                             | 3.22                               | 3.22                                | 18966.77                | 661.89                  | 0.0                      | 46469.45                 | 79.21                   | 79.21                    |
| 4            | 851.87                             | 30.59                              | 0.0                                 | 1751.83                             | 4.28                               | 4.28                                | 17974.44                | 645.52                  | 0.0                      | 36963.64                 | 90.31                   | 90.31                    |
| 5            | 844.90                             | 25.58                              | 0.0                                 | 1776.54                             | -0.00                              | -0.00                               | 19770.57                | 598.62                  | 0.0                      | 41570.96                 | -0.00                   | -0.00                    |
| 6            | 1097.89                            | 23.91                              | 0.0                                 | 1383.61                             | 3.19                               | 3.19                                | 119669.44               | 2606.57                 | 0.0                      | 150813.75                | 348.08                  | 348.08                   |
| 7            | 988.58                             | 18.00                              | 0.0                                 | 1571.56                             | 4.64                               | 4.64                                | 76516.31                | 1393.56                 | 0.0                      | 121638.69                | 359.30                  | 359.30                   |
| 8            | 1052.11                            | 18.05                              | 0.0                                 | 1469.43                             | 3.90                               | 3.90                                | 62916.43                | 1127.05                 | 0.0                      | 87871.76                 | 233.10                  | 233.10                   |
| 9            | 1049.07                            | 22.14                              | 0.0                                 | 1465.18                             | 3.89                               | 3.89                                | 41753.08                | 881.06                  | 0.0                      | 58314.16                 | 154.69                  | 154.69                   |
| 10           | 482.17                             | 352.25                             | 0.0                                 | 1450.27                             | 0.43                               | 0.43                                | 9064.84                 | 6622.32                 | 0.0                      | 27264.97                 | 8.08                    | 8.08                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 16.40                          | 3.28                 | 497.97                 | 8166.64              | 1.633                  | 267.89                 | 4393.43              | 0.879                  | 0.79                   | 13.02                | 0.0026                 |
| 6                       | 0.30                    | 109.00                         | 0.54                 | 1097.89                | 119669.44            | 0.598                  | 23.91                  | 2606.57              | 0.013                  | 3.19                   | 348.08               | 0.0017                 |
| 7                       | 5.00                    | 77.40                          | 6.42                 | 988.58                 | 76516.31             | 6.351                  | 18.00                  | 1393.56              | 0.116                  | 4.64                   | 359.30               | 0.0298                 |
| 9                       | 6.00                    | 39.80                          | 3.98                 | 1049.07                | 41753.08             | 4.175                  | 22.14                  | 881.06               | 0.088                  | 3.89                   | 154.69               | 0.0155                 |
| 10                      | 4.00                    | 18.80                          | 1.26                 | 482.17                 | 9064.84              | 0.607                  | 352.25                 | 6622.32              | 0.444                  | 0.43                   | 8.08                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 15.489               |                        |                      | 13.365                 |                        |                      | 1.539                  |                        |                      | 0.0502                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.863                  |                        |                      | 0.099                  |                        |                      | 0.0032                 |

DATE: 81/77/10

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 361 ENGINE TYPE AND MODEL: IO-360-C

SERIAL NUMBER: 5059-6-C

RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 700. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 30.23 FINISH 30.23

INLET AIR HUMIDITY, GRM H2O/LB AIR: 162.00

RELATIVE HUMIDITY: 81.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 17.60                          | 236.00                        | 0.06472           |
| IDLE/TAXI   |                 | 2            | -0.0          | 18.80                          | 252.00                        | 0.06843           |
| RUN UP      |                 | 3            | -0.0          | 22.30                          | 291.00                        | 0.07323           |
| RUN UP-LEAN |                 | 4            | -0.0          | 19.90                          | 273.00                        | 0.07004           |
| RUN UP-RICH |                 | 5            | -0.0          | 16.40                          | 221.00                        | 0.07146           |
| TAKE-OFF    |                 | 6            | -0.0          | 99.60                          | 1159.00                       | 0.07793           |
| CLIMB       |                 | 7            | -0.0          | 70.30                          | 885.00                        | 0.07248           |
| DESCENT     |                 | 8            | -0.0          | 44.50                          | 546.00                        | 0.07472           |
| APPROACH    |                 | 9            | -0.0          | 23.40                          | 299.00                        | 0.07290           |
| TAXI        |                 | 10           | -0.0          | 17.60                          | 201.00                        | 0.07389           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 751.00                              | -0.00                              | 2.80                     | 10.50                         | 8571.00              | 48.00               | -0.00                    | -0.00                    | 26.00              | -0.00 | -0.00        |
| 2            | 762.00                              | -0.00                              | 3.40                     | 11.10                         | 5042.00              | 86.00               | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 3            | 874.00                              | -0.00                              | 4.80                     | 11.00                         | 2409.00              | 267.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 874.00                              | -0.00                              | 3.20                     | 12.00                         | 2185.00              | 210.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 886.00                              | -0.00                              | 3.90                     | 11.70                         | 1513.00              | 167.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1155.00                             | -0.00                              | 8.00                     | 8.40                          | 4538.00              | 775.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1177.00                             | -0.00                              | 5.80                     | 9.90                          | 2017.00              | 620.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1043.00                             | -0.00                              | 6.60                     | 9.30                          | 2241.00              | 401.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 863.00                              | -0.00                              | 5.40                     | 10.20                         | 3081.00              | 286.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 628.00                              | -0.00                              | 3.60                     | 10.00                         | 25209.00             | 67.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 399.56                             | 70.05                              | 0.0                                 | 2354.26                             | 1.13                               | 1.13                                | 7032.30                 | 1232.87                 | 0.0                      | 41435.01                 | 19.40                   | 19.80                    |
| 2            | 457.79                             | 38.88                              | 0.0                                 | 2348.28                             | 1.90                               | 1.90                                | 8606.47                 | 730.96                  | 0.0                      | 44147.67                 | 35.76                   | 35.76                    |
| 3            | 604.53                             | 17.38                              | 0.0                                 | 2176.73                             | 5.52                               | 5.52                                | 13440.90                | 387.49                  | 0.0                      | 48540.98                 | 123.17                  | 123.17                   |
| 4            | 419.29                             | 16.40                              | 0.0                                 | 2470.47                             | 4.52                               | 4.52                                | 8343.77                 | 326.29                  | 0.0                      | 49162.27                 | 89.94                   | 89.94                    |
| 5            | 500.21                             | 11.11                              | 0.0                                 | 2357.81                             | 3.52                               | 3.52                                | 8203.39                 | 182.27                  | 0.0                      | 38668.13                 | 57.70                   | 57.70                    |
| 6            | 958.95                             | 31.15                              | 0.0                                 | 1582.05                             | 15.26                              | 15.26                               | 95510.94                | 3102.94                 | 0.0                      | 157572.50                | 1519.80                 | 1519.80                  |
| 7            | 736.86                             | 14.68                              | 0.0                                 | 1976.20                             | 12.94                              | 12.94                               | 51801.38                | 1031.73                 | 0.0                      | 138927.06                | 909.55                  | 909.55                   |
| 8            | 826.93                             | 16.08                              | 0.0                                 | 1830.83                             | 8.25                               | 8.25                                | 36798.50                | 715.61                  | 0.0                      | 81471.81                 | 367.24                  | 367.24                   |
| 9            | 685.77                             | 22.41                              | 0.0                                 | 2035.27                             | 5.97                               | 5.97                                | 16046.96                | 524.37                  | 0.0                      | 47625.24                 | 139.60                  | 139.60                   |
| 10           | 451.14                             | 180.93                             | 0.0                                 | 1969.02                             | 1.38                               | 1.38                                | 7940.13                 | 3184.39                 | 0.0                      | 34654.80                 | 24.27                   | 24.27                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 18.80                          | 3.76                 | 457.79                 | 8606.47              | 1.721                  | 78.88                  | 730.96               | 0.146                  | 1.90                   | 35.76                | 0.0072                 |
| 6                       | 0.30                    | 99.60                          | 0.50                 | 958.95                 | 95510.94             | 0.478                  | 31.15                  | 3102.94              | 0.016                  | 15.26                  | 1519.80              | 0.0076                 |
| 7                       | 5.00                    | 70.30                          | 5.83                 | 736.86                 | 51801.38             | 4.300                  | 14.68                  | 1031.73              | 0.086                  | 12.94                  | 909.55               | 0.0755                 |
| 9                       | 6.00                    | 23.40                          | 2.34                 | 685.77                 | 16046.96             | 1.605                  | 22.41                  | 524.37               | 0.052                  | 5.97                   | 139.60               | 0.0140                 |
| 10                      | 4.00                    | 17.60                          | 1.18                 | 451.14                 | 7940.13              | 0.532                  | 180.93                 | 3184.39              | 0.213                  | 1.38                   | 24.27                | 0.0016                 |
| TOTAL FOR CYCLE         |                         |                                | 13.612               |                        |                      | 8.635                  |                        |                      | 0.513                  |                        |                      | 0.1058                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.634                  |                        |                      | 0.038                  |                        |                      | 0.0078                 |

DATE: 8/17/61

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 362 ENGINE TYPE AND MODEL: IO-360-C

SERIAL NUMBER: 50591-6CA

RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 700. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.24 FINISH 30.24

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 75.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 21.10                          | 257.00                        | 0.06052           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 250.00                        | 0.06495           |
| RUN UP      |                 | 3            | -0.0          | 22.30                          | 292.00                        | 0.06991           |
| RUN UP-LEAN |                 | 4            | -0.0          | 19.90                          | 269.00                        | 0.06836           |
| RUN UP-RICH |                 | 5            | -0.0          | 18.80                          | 252.00                        | 0.06782           |
| TAKE-OFF    |                 | 6            | -0.0          | 93.80                          | 1110.00                       | 0.07768           |
| CLIMB       |                 | 7            | -0.0          | 63.30                          | 82.00                         | 0.07179           |
| DESCENT     |                 | 8            | -0.0          | 41.00                          | 509.00                        | 0.07199           |
| APPROACH    |                 | 9            | -0.0          | 27.00                          | 335.00                        | 0.06999           |
| TAXI        |                 | 10           | -0.0          | 19.90                          | 234.00                        | 0.06737           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 560.00                              | -0.00                              | 2.30                     | 9.20                          | 16636.00             | 84.00               | -0.00                    | -0.00                    | 46.00              | -0.00 | -0.00        |
| 2            | 605.00                              | -0.00                              | 3.40                     | 10.10                         | 11146.00             | 79.00               | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |
| 3            | 830.00                              | -0.00                              | 4.40                     | 10.60                         | 2884.00              | 269.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 785.00                              | -0.00                              | 3.60                     | 11.20                         | 1941.00              | 163.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 852.00                              | -0.00                              | 3.70                     | 11.00                         | 1608.00              | 153.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1155.00                             | -0.00                              | 7.60                     | 8.80                          | 4325.00              | 336.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1211.00                             | -0.00                              | 5.00                     | 10.50                         | 1885.00              | 791.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 8            | 1076.00                             | -0.00                              | 6.10                     | 9.30                          | 2440.00              | 456.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 9            | 919.00                              | -0.00                              | 5.60                     | 9.20                          | 4048.00              | 269.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 673.00                              | -0.00                              | 3.60                     | 9.20                          | 18466.00             | 56.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 352.98                             | 146.22                             | 0.0                                 | 2218.47                             | 2.12                               | 2.12                                | 7447.95                 | 3085.34                 | 0.0                      | 46809.66                 | 44.68                   | 44.68                    |
| 2            | 470.00                             | 88.24                              | 0.0                                 | 2193.69                             | 1.79                               | 1.79                                | 9352.91                 | 1756.03                 | 0.0                      | 43654.36                 | 35.70                   | 35.70                    |
| 3            | 581.42                             | 21.83                              | 0.0                                 | 2200.82                             | 5.84                               | 5.84                                | 12965.73                | 486.73                  | 0.0                      | 49078.20                 | 130.20                  | 130.20                   |
| 4            | 485.05                             | 14.98                              | 0.0                                 | 2371.03                             | 3.61                               | 3.61                                | 9652.43                 | 298.06                  | 0.0                      | 47183.55                 | 71.79                   | 71.79                    |
| 5            | 502.99                             | 12.52                              | 0.0                                 | 2349.58                             | 3.42                               | 3.42                                | 9456.25                 | 235.37                  | 0.0                      | 44172.10                 | 64.23                   | 64.23                    |
| 6            | 912.15                             | 29.73                              | 0.0                                 | 1659.49                             | 6.62                               | 6.62                                | 8559.69                 | 2788.61                 | 0.0                      | 155659.81                | 621.32                  | 621.32                   |
| 7            | 643.86                             | 13.90                              | 0.0                                 | 2124.46                             | 16.73                              | 16.73                               | 40756.21                | 880.00                  | 0.0                      | 134477.94                | 1059.06                 | 1059.06                  |
| 8            | 787.74                             | 18.05                              | 0.0                                 | 1887.01                             | 9.67                               | 9.67                                | 32297.39                | 739.90                  | 0.0                      | 77367.56                 | 396.57                  | 396.57                   |
| 9            | 744.06                             | 30.80                              | 0.0                                 | 1920.65                             | 5.87                               | 5.87                                | 20089.66                | 831.71                  | 0.0                      | 51857.42                 | 158.51                  | 158.51                   |
| 10           | 496.55                             | 145.88                             | 0.0                                 | 1993.84                             | 1.27                               | 1.27                                | 9881.44                 | 2902.93                 | 0.0                      | 39677.47                 | 25.25                   | 25.25                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.90                          | 3.98                 | 470.00                 | 9352.91              | 1.871                  | 88.24                  | 1756.03              | 0.351                  | 1.79                   | 35.70                | 0.0071                 |
| 6                       | 0.30                    | 93.80                          | 0.47                 | 912.15                 | 8559.69              | 0.429                  | 29.73                  | 2788.61              | 0.014                  | 6.62                   | 621.32               | 0.0031                 |
| 7                       | 5.00                    | 63.30                          | 5.25                 | 643.86                 | 40756.21             | 3.383                  | 13.90                  | 880.00               | 0.073                  | 16.73                  | 1059.06              | 0.0879                 |
| 9                       | 6.00                    | 27.00                          | 2.70                 | 744.06                 | 20089.66             | 2.009                  | 30.80                  | 831.71               | 0.083                  | 5.87                   | 158.51               | 0.0159                 |
| 10                      | 4.00                    | 19.90                          | 1.33                 | 496.55                 | 9881.44              | 0.662                  | 145.88                 | 2902.93              | 0.194                  | 1.27                   | 25.25                | 0.0017                 |
| TOTAL FOR CYCLE         |                         |                                | 13.736               |                        |                      | 8.352                  |                        |                      | 0.716                  |                        |                      | 0.1157                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.608                  |                        |                      | 0.052                  |                        |                      | 0.0084                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 364 ENGINE TYPE AND MODEL: IO-360-C

SERIAL NUMBER: 50591-6-CC

RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 700. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 30.21 FINISH 30.21

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 157.00                        | 0.07829           |
| IDLE/TAXI   |                 | 2            | -0.0          | 16.40                          | 185.00                        | 0.07736           |
| RUN UP      |                 | 3            | -0.0          | 25.80                          | 311.00                        | 0.07765           |
| RUN UP-LEAN |                 | 4            | -0.0          | 24.60                          | 299.00                        | 0.07677           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.30                          | 276.00                        | 0.07478           |
| TAKE-OFF    |                 | 6            | -0.0          | 93.80                          | 1185.00                       | 0.07518           |
| CLIMB       |                 | 7            | -0.0          | 64.50                          | 838.00                        | 0.07321           |
| DESCENT     |                 | 8            | -0.0          | 45.70                          | 577.00                        | 0.07512           |
| APPROACH    |                 | 9            | -0.0          | 25.80                          | 337.00                        | 0.07216           |
| TAXI        |                 | 10           | -0.0          | 18.80                          | 233.00                        | 0.07207           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 617.00                              | -0.00                              | 4.50                     | 8.90                          | 35935.00             | 22.00               | -0.00                    | -0.00                    | 40.00              | -0.00 | -0.00        |
| 2            | 673.00                              | -0.00                              | 5.60                     | 9.30                          | 19132.00             | 38.00               | -0.00                    | -0.00                    | 28.00              | -0.00 | -0.00        |
| 3            | 975.00                              | -0.00                              | 7.20                     | 9.30                          | 3660.00              | 137.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 953.00                              | -0.00                              | 6.90                     | 9.30                          | 4769.00              | 80.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 998.00                              | -0.00                              | 6.30                     | 9.70                          | 2773.00              | 108.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1312.00                             | -0.00                              | 5.70                     | 10.30                         | 4104.00              | 916.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1390.00                             | -0.00                              | 5.00                     | 10.80                         | 2218.00              | 675.00              | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 8            | 1278.00                             | -0.00                              | 6.00                     | 10.40                         | 26.60                | 434.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 942.00                              | -0.00                              | 4.70                     | 10.80                         | 2939.00              | 395.00              | -0.00                    | -0.00                    | 22.00              | -0.00 | -0.00        |
| 10           | 807.00                              | -0.00                              | 4.00                     | 10.60                         | 11645.00             | 62.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 534.97                             | 244.67                             | 0.0                                 | 1662.44                             | 0.43                               | 0.43                                | 8131.58                 | 3718.99                 | 0.0                      | 25269.15                 | 6.53                    | 6.53                     |
| 2            | 672.88                             | 131.66                             | 0.0                                 | 1755.79                             | 0.75                               | 0.75                                | 11035.27                | 2159.24                 | 0.0                      | 28794.93                 | 12.30                   | 12.30                    |
| 3            | 862.43                             | 25.11                              | 0.0                                 | 1750.29                             | 2.70                               | 2.70                                | 22250.59                | 647.79                  | 0.0                      | 45157.55                 | 69.54                   | 69.54                    |
| 4            | 835.86                             | 33.09                              | 0.0                                 | 1770.14                             | 1.59                               | 1.59                                | 20562.24                | 813.94                  | 0.0                      | 43545.42                 | 39.16                   | 39.16                    |
| 5            | 781.92                             | 19.71                              | 0.0                                 | 1891.60                             | 2.20                               | 2.20                                | 17436.70                | 439.56                  | 0.0                      | 42182.66                 | 49.10                   | 49.10                    |
| 6            | 701.71                             | 28.94                              | 0.0                                 | 1992.32                             | 18.52                              | 18.52                               | 65820.31                | 2714.18                 | 0.0                      | 186879.06                | 1737.40                 | 1737.40                  |
| 7            | 630.46                             | 16.02                              | 0.0                                 | 2139.70                             | 13.98                              | 13.98                               | 40664.91                | 1033.13                 | 0.0                      | 138010.50                | 901.73                  | 901.73                   |
| 8            | 738.99                             | 0.19                               | 0.0                                 | 2012.61                             | 8.78                               | 8.78                                | 33771.85                | 8.57                    | 0.0                      | 91976.13                 | 401.25                  | 401.25                   |
| 9            | 601.19                             | 21.53                              | 0.0                                 | 2170.57                             | 8.30                               | 8.30                                | 15510.64                | 555.49                  | 0.0                      | 56000.78                 | 214.12                  | 214.12                   |
| 10           | 512.60                             | 85.47                              | 0.0                                 | 2134.35                             | 1.31                               | 1.31                                | 9636.94                 | 1606.81                 | 0.0                      | 40125.76                 | 24.54                   | 24.54                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 16.40                          | 3.28                 | 672.88                 | 11035.27             | 2.207                  | 131.66                 | 2159.24              | 0.432                  | 6.75                   | 12.30                | 0.0025                 |
| 6                       | 0.30                    | 93.80                          | 0.47                 | 701.71                 | 65820.31             | 0.329                  | 28.94                  | 2714.18              | 0.014                  | 18.52                  | 1737.40              | 0.0087                 |
| 7                       | 5.00                    | 64.50                          | 5.35                 | 630.46                 | 40664.91             | 3.375                  | 16.02                  | 1033.13              | 0.086                  | 13.98                  | 901.73               | 0.0748                 |
| 9                       | 6.00                    | 25.80                          | 2.58                 | 601.19                 | 15510.64             | 1.551                  | 21.53                  | 555.49               | 0.056                  | 8.30                   | 214.12               | 0.0214                 |
| 10                      | 4.00                    | 18.80                          | 1.26                 | 512.60                 | 9636.94              | 0.646                  | 85.47                  | 1606.81              | 0.108                  | 1.31                   | 24.54                | 0.0016                 |
| TOTAL FOR CYCLE         |                         |                                | 12.942               |                        |                      | 8.108                  |                        |                      | 0.694                  |                        |                      | 0.1090                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.676                  |                        |                      | 0.054                  |                        |                      | 0.0084                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYME-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 365 ENGINE TYPE AND MODEL: IO-360-C SERIAL NUMBER: 55651-6-D  
RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 700. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 30.21 FINISH 30.21

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 74.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | 19.90                          | 168.00                        | 0.08591           |
| IOLE/TAXI   |                 | 2            | -0.0          | 21.10                          | 208.00                        | 0.08043           |
| RUN UP      |                 | 3            | -0.0          | 31.60                          | 381.00                        | 0.07723           |
| RUN UP-LEAN |                 | 4            | -0.0          | 35.20                          | 437.00                        | 0.07668           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.30                          | 273.00                        | 0.07641           |
| TAKE-OFF    |                 | 6            | -0.0          | 96.10                          | 1118.00                       | 0.07295           |
| CLIMB       |                 | 7            | -0.0          | 66.80                          | 775.00                        | 0.07742           |
| DESCENT     |                 | 8            | -0.0          | 49.20                          | 547.00                        | 0.07968           |
| APPROACH    |                 | 9            | -0.0          | 23.80                          | 332.00                        | 0.08406           |
| TAXI        |                 | 10           | -0.0          | 21.10                          | 158.00                        | 0.08514           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYOES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 673.00                              | -0.00                              | 5.30                     | 7.20                          | 62010.00             | 29.00               | -0.00                    | -0.00                    | 37.00              | -0.00 | -0.00        |
| 2            | 717.00                              | -0.00                              | 5.10                     | 8.40                          | 39137.00             | 51.00               | -0.00                    | -0.00                    | 46.00              | -0.00 | -0.00        |
| 3            | 1031.00                             | -0.00                              | 7.10                     | 9.20                          | 4675.00              | 271.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1020.00                             | -0.00                              | 6.30                     | 10.00                         | 4131.00              | 160.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1065.00                             | -0.00                              | 6.60                     | 9.50                          | 5164.00              | 194.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1300.00                             | -0.00                              | 7.40                     | 7.90                          | 4457.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1312.00                             | -0.00                              | 8.10                     | 8.30                          | 3370.00              | 213.00              | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 9.20                     | 7.50                          | 4566.00              | 164.00              | -0.00                    | -0.00                    | 28.00              | -0.00 | -0.00        |
| 9            | 1110.00                             | -0.00                              | 9.40                     | 7.10                          | 15655.00             | 88.00               | -0.00                    | -0.00                    | 57.00              | -0.00 | -0.00        |
| 10           | 762.00                              | -0.00                              | 4.80                     | 6.20                          | 72566.00             | 58.00               | -0.00                    | -0.00                    | 61.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 578.74                             | 375.30                             | 0.0                                 | 1235.31                             | 0.52                               | 0.52                                | 11516.89                | 7468.42                 | 0.0                      | 24582.73                 | 10.35                   | 10.35                    |
| 2            | 591.67                             | 260.04                             | 0.0                                 | 1531.19                             | 0.97                               | 0.97                                | 12484.27                | 5486.88                 | 0.0                      | 32308.03                 | 20.51                   | 20.51                    |
| 3            | 855.44                             | 32.26                              | 0.0                                 | 1741.64                             | 5.36                               | 5.36                                | 27032.03                | 1019.41                 | 0.0                      | 55035.93                 | 169.48                  | 169.48                   |
| 4            | 761.53                             | 28.60                              | 0.0                                 | 1899.26                             | 3.18                               | 3.18                                | 26805.75                | 1006.67                 | 0.0                      | 66853.75                 | 111.82                  | 111.82                   |
| 5            | 802.43                             | 35.96                              | 0.0                                 | 1814.79                             | 3.87                               | 3.87                                | 17894.24                | 801.86                  | 0.0                      | 40469.83                 | 86.40                   | 86.40                    |
| 6            | 949.45                             | 32.75                              | 0.0                                 | 1592.60                             | -0.00                              | -0.00                               | 91242.00                | 3147.39                 | 0.0                      | 153048.31                | -0.00                   | -0.00                    |
| 7            | 977.71                             | 23.30                              | 0.0                                 | 1574.13                             | 4.22                               | 4.22                                | 65310.84                | 1556.24                 | 0.0                      | 105151.69                | 282.10                  | 282.10                   |
| 8            | 1083.32                            | 30.79                              | 0.0                                 | 1387.62                             | 3.17                               | 3.17                                | 53299.54                | 1515.01                 | 0.0                      | 68270.81                 | 156.06                  | 156.06                   |
| 9            | 1051.19                            | 100.27                             | 0.0                                 | 1247.52                             | 1.62                               | 1.62                                | 25018.22                | 2386.31                 | 0.0                      | 29691.01                 | 38.47                   | 38.47                    |
| 10           | 531.16                             | 459.90                             | 0.0                                 | 1077.98                             | 1.05                               | 1.05                                | 11207.41                | 9703.82                 | 0.0                      | 22745.44                 | 22.24                   | 22.24                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 21.10                          | 4.22                 | 591.67                 | 12484.27             | 2.497                  | 260.04                 | 5486.88              | 1.097                  | 0.97                   | 20.51                | 0.0041                 |
| 6                       | 0.30                    | 96.10                          | 0.48                 | 949.45                 | 91242.00             | 0.456                  | 32.75                  | 3147.39              | 0.016                  | -0.00                  | -0.00                | -0.0000                |
| 7                       | 5.00                    | 66.80                          | 5.54                 | 977.71                 | 65310.84             | 5.421                  | 23.30                  | 1556.24              | 0.129                  | 4.22                   | 282.10               | 0.0234                 |
| 9                       | 6.00                    | 23.80                          | 2.38                 | 1051.19                | 25018.22             | 2.502                  | 100.27                 | 2386.31              | 0.239                  | 1.62                   | 38.47                | 0.0038                 |
| 10                      | 4.00                    | 21.10                          | 1.41                 | 531.16                 | 11207.41             | 0.751                  | 459.90                 | 9703.82              | 0.650                  | 1.05                   | 22.24                | 0.0015                 |
| TOTAL FOR CYCLE         |                         |                                | 14.039               |                        |                      | 11.627                 |                        |                      | 2.131                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.828                  |                        |                      | 0.152                  |                        |                      | -0.0000                |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 253 ENGINE TYPE AND MODEL: IO-470-C

SERIAL NUMBER: 71018-7-CA

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 761. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 76.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 19.30                          | 108.00                        | 0.06856           |
| IDLE/TAXI   |                 | 2            | -0.0          | 26.40                          | 233.00                        | 0.07168           |
| RUN UP      |                 | 3            | -0.0          | 38.70                          | 435.00                        | 0.06768           |
| RUN UP-LEAN |                 | 4            | -0.0          | 38.70                          | 445.00                        | 0.06568           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 362.00                        | 0.06510           |
| TAKE-OFF    |                 | 6            | -0.0          | 107.20                         | 1296.00                       | 0.06573           |
| CLIMB       |                 | 7            | -0.0          | 86.10                          | 1038.00                       | 0.06435           |
| DESCENT     |                 | 8            | -0.0          | 73.80                          | 872.00                        | 0.06378           |
| APPROACH    |                 | 9            | -0.0          | 52.70                          | 622.00                        | 0.06238           |
| TAXI        |                 | 10           | -0.0          | 33.40                          | 255.00                        | 0.07107           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 359.00                              | -0.00                              | 4.40                   | 2.90                          | 71867.00             | 2.00                | -0.00                    | -0.00                    | 69.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 6.70                   | 5.30                          | 32966.00             | 7.00                | -0.00                    | -0.00                    | 41.00              | -0.00 | -0.00        |
| 3            | 986.00                              | -0.00                              | 7.60                   | 6.60                          | 3228.00              | 52.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 964.00                              | -0.00                              | 6.90                   | 6.90                          | 3173.00              | 42.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 975.00                              | -0.00                              | 7.00                   | 6.70                          | 2786.00              | 41.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1412.00                             | -0.00                              | 6.10                   | 7.90                          | 1959.00              | 191.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1401.00                             | -0.00                              | 6.00                   | 7.70                          | 1848.00              | 331.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1312.00                             | -0.00                              | 6.30                   | 7.20                          | 2299.00              | 234.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1222.00                             | -0.00                              | 6.20                   | 7.00                          | 2179.00              | 201.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 706.00                              | -0.00                              | 6.60                   | 4.10                          | 43865.00             | 16.00               | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 613.60                             | 573.79                             | 0.0                                 | 635.43                              | 0.05                               | 0.05                                | 11942.46                | 11078.06                | 0.0                      | 12263.82                 | 0.88                    | 0.88                     |
| 2            | 884.86                             | 249.37                             | 0.0                                 | 1099.80                             | 0.15                               | 0.15                                | 23360.36                | 6583.29                 | 0.0                      | 29034.82                 | 4.01                    | 4.01                     |
| 3            | 1057.22                            | 25.72                              | 0.0                                 | 1442.56                             | 1.19                               | 1.19                                | 40914.38                | 995.27                  | 0.0                      | 55827.01                 | 45.98                   | 45.98                    |
| 4            | 987.41                             | 26.01                              | 0.0                                 | 1551.45                             | 0.99                               | 0.99                                | 38212.92                | 1006.41                 | 0.0                      | 60041.07                 | 38.21                   | 38.21                    |
| 5            | 1011.66                            | 23.06                              | 0.0                                 | 1521.43                             | 0.97                               | 0.97                                | 31968.57                | 728.70                  | 0.0                      | 48077.09                 | 30.76                   | 30.76                    |
| 6            | 868.10                             | 15.97                              | 0.0                                 | 1766.46                             | 4.46                               | 4.46                                | 93060.00                | 1711.64                 | 0.0                      | 189364.56                | 478.62                  | 478.62                   |
| 7            | 873.00                             | 15.40                              | 0.0                                 | 1760.32                             | 7.91                               | 7.91                                | 75165.13                | 1325.91                 | 0.0                      | 151563.31                | 681.10                  | 681.10                   |
| 8            | 976.99                             | 19.37                              | 0.0                                 | 1664.58                             | 5.66                               | 5.66                                | 68411.81                | 1429.80                 | 0.0                      | 122846.06                | 417.38                  | 417.38                   |
| 9            | 933.49                             | 18.79                              | 0.0                                 | 1655.97                             | 4.97                               | 4.97                                | 49194.84                | 990.22                  | 0.0                      | 87269.81                 | 261.97                  | 261.97                   |
| 10           | 883.81                             | 336.42                             | 0.0                                 | 862.65                              | 0.35                               | 0.35                                | 29519.12                | 11236.30                | 0.0                      | 28812.54                 | 11.75                   | 11.75                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 26.40                          | 5.28                 | 884.86                 | 23360.36             | 4.672                  | 249.37                 | 6583.29              | 1.317                  | 0.15                   | 4.01                 | 0.0008                 |
| 6                       | 0.30                    | 107.20                         | 0.54                 | 868.10                 | 93060.00             | 0.465                  | 15.47                  | 1711.64              | 0.009                  | 4.46                   | 478.62               | 0.0024                 |
| 7                       | 5.00                    | 86.10                          | 7.15                 | 873.00                 | 75165.13             | 6.239                  | 15.40                  | 1325.91              | 0.110                  | 7.91                   | 681.10               | 0.0565                 |
| 9                       | 6.00                    | 52.70                          | 5.27                 | 933.49                 | 49194.84             | 4.919                  | 18.79                  | 990.22               | 0.099                  | 4.97                   | 261.97               | 0.0262                 |
| 10                      | 4.00                    | 33.40                          | 2.24                 | 883.81                 | 29519.12             | 1.978                  | 336.42                 | 11236.30             | 0.753                  | 0.35                   | 11.75                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 20.470               |                        |                      | 18.273                 |                        |                      | 2.287                  |                        |                      | 0.0867                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.893                  |                        |                      | 0.112                  |                        |                      | 0.0042                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 254 ENGINE TYPE AND MODEL: 10-470-C SERIAL NUMBER: 71018-T-CB

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 761. MRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 44.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.30                           | 39.00                         | 0.06223           |
| IDLE/TAXI   |                 | 2            | -0.0          | 10.50                          | 117.00                        | 0.06577           |
| RUN UP      |                 | 3            | -0.0          | 26.40                          | 292.00                        | 0.06689           |
| RUN UP-LEAN |                 | 4            | -0.0          | 22.90                          | 263.00                        | 0.05335           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.90                          | 258.00                        | 0.06236           |
| TAKE-OFF    |                 | 6            | -0.0          | 66.80                          | 795.00                        | 0.06505           |
| CLIMB       |                 | 7            | -0.0          | 61.50                          | 744.00                        | 0.06293           |
| DESCENT     |                 | 8            | -0.0          | 59.80                          | 713.00                        | 0.06405           |
| APPROACH    |                 | 9            | -0.0          | 36.90                          | 433.00                        | 0.06438           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 115.00                        | 0.07482           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 370.00                              | -0.00                              | 4.30                     | 4.10                          | 48212.00             | 3.00                | -0.00                    | -0.00                    | 53.00              | -0.00 | -0.00        |
| 2            | 639.00                              | -0.00                              | 5.30                     | 7.40                          | 14770.00             | 28.00               | -0.00                    | -0.00                    | 35.00              | -0.00 | -0.00        |
| 3            | 964.00                              | -0.00                              | 7.70                     | 6.30                          | 3344.00              | 69.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 897.00                              | -0.00                              | 5.90                     | 5.50                          | -0.00                | 49.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 964.00                              | -0.00                              | 6.90                     | 6.20                          | 2620.00              | 56.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1368.00                             | -0.00                              | 6.30                     | 7.50                          | 2229.00              | 281.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1390.00                             | -0.00                              | 5.80                     | 7.60                          | 1728.00              | 319.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1345.00                             | -0.00                              | 6.20                     | 7.40                          | 2006.00              | 281.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1211.00                             | -0.00                              | 6.50                     | 7.10                          | 2508.00              | 205.00              | -0.00                    | -0.00                    | 22.00              | -0.00 | -0.00        |
| 10           | 695.00                              | -0.00                              | 7.60                     | 4.60                          | 37120.00             | 16.00               | -0.00                    | -0.00                    | 33.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 657.05                             | 421.92                             | 0.0                                 | 984.36                              | 0.08                               | 0.08                                | 3482.37                 | 2736.18                 | 0.0                      | 5217.09                  | 0.40                    | 0.40                     |
| 2            | 755.25                             | 120.54                             | 0.0                                 | 1656.87                             | 0.66                               | 0.66                                | 7930.17                 | 1265.71                 | 0.0                      | 17397.09                 | 6.88                    | 6.88                     |
| 3            | 1085.21                            | 26.99                              | 0.0                                 | 1395.09                             | 1.60                               | 1.60                                | 28649.49                | 712.59                  | 0.0                      | 36830.27                 | 42.17                   | 42.17                    |
| 4            | 1045.56                            | -0.00                              | 0.0                                 | 1531.43                             | 1.43                               | 1.43                                | 23943.31                | -0.00                   | 0.0                      | 35069.81                 | 32.66                   | 32.66                    |
| 5            | 1043.23                            | 22.69                              | 0.0                                 | 1472.86                             | 1.39                               | 1.39                                | 23889.92                | 519.53                  | 0.0                      | 33728.39                 | 31.85                   | 31.85                    |
| 6            | 907.62                             | 18.39                              | 0.0                                 | 1697.71                             | 6.65                               | 6.65                                | 60629.03                | 1228.56                 | 0.0                      | 113406.94                | 444.19                  | 444.19                   |
| 7            | 863.60                             | 14.73                              | 0.0                                 | 1777.40                             | 7.80                               | 7.80                                | 53092.76                | 905.93                  | 0.0                      | 109309.81                | 479.64                  | 479.64                   |
| 8            | 907.60                             | 16.82                              | 0.0                                 | 1702.06                             | 6.76                               | 6.76                                | 54274.61                | 1005.73                 | 0.0                      | 101782.94                | 404.05                  | 404.05                   |
| 9            | 948.07                             | 20.95                              | 0.0                                 | 1627.13                             | 4.91                               | 4.91                                | 34983.78                | 773.08                  | 0.0                      | 60041.24                 | 181.23                  | 181.23                   |
| 10           | 964.92                             | 269.92                             | 0.0                                 | 917.64                              | 0.33                               | 0.33                                | 13605.35                | 3805.83                 | 0.0                      | 12938.75                 | 4.70                    | 4.70                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 10.50                          | 2.10                 | 755.25                 | 7930.17              | 1.586                  | 120.54                 | 1265.71              | 0.253                  | 0.66                   | 6.88                 | 0.0014                 |
| 6                       | 0.30                    | 66.80                          | 0.33                 | 907.62                 | 60629.03             | 0.303                  | 18.39                  | 1228.56              | 0.006                  | 6.65                   | 444.19               | 0.0022                 |
| 7                       | 5.00                    | 61.50                          | 5.10                 | 863.30                 | 53092.76             | 4.407                  | 14.73                  | 905.93               | 0.075                  | 7.80                   | 479.64               | 0.0396                 |
| 9                       | 6.00                    | 36.90                          | 3.69                 | 948.07                 | 14983.78             | 3.498                  | 20.95                  | 773.08               | 0.077                  | 4.91                   | 181.23               | 0.0181                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 964.92                 | 13605.35             | 0.912                  | 269.92                 | 3805.83              | 0.255                  | 0.33                   | 4.70                 | 0.0003                 |
| TOTAL FOR CYCLE         |                         |                                | 12.173               |                        |                      | 10.706                 |                        |                      | 0.667                  |                        |                      | 0.0618                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.879                  |                        |                      | 0.055                  |                        |                      | 0.0051                 |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 255 ENGINE TYPE AND MODEL: IO-470-C

SERIAL NUMBER: 71010-7-CC

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 761. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 5.30                           | 30.00                         | 0.07204           |
| IDLE/TAXI   |                 | 2            | -0.0          | 7.00                           | 63.00                         | 0.07133           |
| RUN UP      |                 | 3            | -0.0          | 19.30                          | 210.00                        | 0.06572           |
| RUN UP-LEAN |                 | 4            | -0.0          | 22.90                          | 264.00                        | 0.06469           |
| RUN UP-RICH |                 | 5            | -0.0          | 22.90                          | 264.00                        | 0.06321           |
| TAKE-OFF    |                 | 6            | -0.0          | 103.70                         | 1200.00                       | 0.06476           |
| CLIMB       |                 | 7            | -0.0          | 79.10                          | 966.00                        | 0.06141           |
| DESCENT     |                 | 8            | -0.0          | 63.30                          | 748.00                        | 0.06190           |
| APPROACH    |                 | 9            | -0.0          | 38.70                          | 456.00                        | 0.06252           |
| TAXI        |                 | 10           | -0.0          | 5.30                           | 42.00                         | 0.07347           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 460.00                              | -0.00                              | 4.20                     | 3.40                          | 76585.00             | 3.00                | -0.00                    | -0.00                    | 94.00              | -0.00 | -0.00        |
| 2            | 751.00                              | -0.00                              | 6.70                     | 5.40                          | 31293.00             | 14.00               | -0.00                    | -0.00                    | 45.00              | -0.00 | -0.00        |
| 3            | 1099.00                             | -0.00                              | 7.80                     | 5.80                          | 4502.00              | 57.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1099.00                             | -0.00                              | 6.60                     | 6.90                          | 4063.00              | 42.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1143.00                             | -0.00                              | 6.60                     | 6.70                          | 2745.00              | 40.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1401.00                             | -0.00                              | 6.80                     | 6.90                          | 2196.00              | 216.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1469.00                             | -0.00                              | 5.50                     | 7.60                          | 1482.00              | 298.00              | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 8            | 1368.00                             | -0.00                              | 6.10                     | 7.00                          | 2141.00              | 240.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 9            | 1334.00                             | -0.00                              | 6.20                     | 7.00                          | 2470.00              | 191.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 10           | 830.00                              | -0.00                              | 6.30                     | 4.80                          | 45457.00             | 14.00               | -0.00                    | -0.00                    | 64.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 556.08                             | 580.74                             | 0.0                                 | 707.31                              | 0.07                               | 0.07                                | 2947.24                 | 3077.90                 | 0.0                      | 3748.72                  | 0.35                    | 0.35                     |
| 2            | 888.78                             | 237.75                             | 0.0                                 | 1125.52                             | 0.31                               | 0.31                                | 6221.49                 | 1664.23                 | 0.0                      | 7878.65                  | 2.14                    | 2.14                     |
| 3            | 1121.54                            | 37.07                              | 0.0                                 | 1310.34                             | 1.35                               | 1.35                                | 21645.66                | 715.53                  | 0.0                      | 25289.63                 | 25.98                   | 25.98                    |
| 4            | 958.81                             | 33.81                              | 0.0                                 | 1574.99                             | 1.00                               | 1.00                                | 21956.82                | 774.14                  | 0.0                      | 36067.23                 | 22.95                   | 22.95                    |
| 5            | 982.25                             | 23.40                              | 0.0                                 | 1566.72                             | 0.98                               | 0.98                                | 22493.50                | 535.80                  | 0.0                      | 35877.82                 | 22.39                   | 22.39                    |
| 6            | 986.92                             | 18.25                              | 0.0                                 | 1573.48                             | 5.15                               | 5.15                                | 102344.06               | 1892.91                 | 0.0                      | 163170.25                | 533.98                  | 533.98                   |
| 7            | 838.70                             | 12.94                              | 0.0                                 | 1820.94                             | 7.46                               | 7.46                                | 66341.25                | 1023.80                 | 0.0                      | 144036.56                | 590.42                  | 590.42                   |
| 8            | 925.59                             | 18.61                              | 0.0                                 | 1668.89                             | 5.98                               | 5.98                                | 58589.96                | 1177.76                 | 0.0                      | 105640.31                | 378.64                  | 378.64                   |
| 9            | 931.47                             | 21.25                              | 0.0                                 | 1652.39                             | 4.71                               | 4.71                                | 36047.82                | 822.49                  | 0.0                      | 63947.51                 | 182.41                  | 182.41                   |
| 10           | 813.48                             | 336.17                             | 0.0                                 | 973.84                              | 0.30                               | 0.30                                | 4311.45                 | 1781.67                 | 0.0                      | 5161.33                  | 1.57                    | 1.57                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 7.00                           | 1.40                 | 888.78                 | 6221.49              | 1.244                  | 237.75                 | 1664.23              | 0.333                  | 0.31                   | 2.14                 | 0.0004                 |
| 6                       | 0.30                    | 103.70                         | 0.52                 | 986.92                 | 102344.06            | 0.512                  | 18.25                  | 1892.91              | 0.009                  | 5.15                   | 533.98               | 0.0027                 |
| 7                       | 5.00                    | 79.10                          | 6.57                 | 838.70                 | 66341.25             | 5.506                  | 12.94                  | 1023.80              | 0.085                  | 7.46                   | 590.42               | 0.0490                 |
| 9                       | 6.00                    | 38.70                          | 3.87                 | 931.47                 | 36047.82             | 3.605                  | 21.25                  | 822.49               | 0.082                  | 4.71                   | 182.41               | 0.0182                 |
| 10                      | 4.00                    | 5.30                           | 0.36                 | 813.48                 | 4311.45              | 0.289                  | 336.17                 | 1781.67              | 0.119                  | 0.30                   | 1.57                 | 0.0001                 |
| TOTAL FOR CYCLE         |                         |                                | 12.709               |                        |                      | 11.156                 |                        |                      | 0.629                  |                        |                      | 0.0704                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.878                  |                        |                      | 0.049                  |                        |                      | 0.0055                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 193 ENGINE TYPE AND MODEL: IO-470-V SERIAL NUMBER: 170012-7-V-RA

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 971. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 30.23 FINISH 30.23

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 47.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 25.20                          | 272.00                        | 0.03766           |
| IDLE/TAXI   |                 | 2            | -0.0          | 29.30                          | 319.00                        | 0.07404           |
| RUN UP      |                 | 3            | -0.0          | 41.00                          | 459.00                        | 0.08208           |
| RUN UP-LEAN |                 | 4            | -0.0          | 41.00                          | 475.00                        | 0.07812           |
| RUN UP-RICH |                 | 5            | -0.0          | 41.00                          | 471.00                        | 0.07909           |
| TAKE-OFF    |                 | 6            | -0.0          | 111.30                         | 1317.00                       | 0.08056           |
| CLIMB       |                 | 7            | -0.0          | 80.90                          | 977.00                        | 0.07565           |
| DESCENT     |                 | 8            | -0.0          | 76.20                          | 896.00                        | 0.07781           |
| APPROACH    |                 | 9            | -0.0          | 63.30                          | 731.00                        | 0.07941           |
| TAXI        |                 | 10           | -0.0          | 29.30                          | 312.00                        | 0.05872           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 390.00                              | -0.00                              | 2.60                     | 4.20                          | 12100.00             | 5.00                | -0.00                    | -0.00                    | 54.00              | -0.00 | -0.00        |
| 2            | 852.00                              | -0.00                              | 6.50                     | 7.80                          | 16806.00             | 21.00               | -0.00                    | -0.00                    | 50.00              | -0.00 | -0.00        |
| 3            | 1199.00                             | -0.00                              | 9.10                     | 8.10                          | 5210.00              | 82.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1256.00                             | -0.00                              | 7.90                     | 8.90                          | 5042.00              | 63.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1256.00                             | -0.00                              | 8.20                     | 8.40                          | 5042.00              | 63.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1469.00                             | -0.00                              | 7.50                     | 9.40                          | 6050.00              | 163.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1446.00                             | -0.00                              | 7.00                     | 9.10                          | 3193.00              | 166.00              | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 8            | 1368.00                             | -0.00                              | 7.80                     | 8.70                          | 3529.00              | 122.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1323.00                             | -0.00                              | 8.30                     | 8.50                          | 3809.00              | 133.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | 673.00                              | -0.00                              | 5.00                     | 6.00                          | 15798.00             | 41.00               | -0.00                    | -0.00                    | 36.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 655.76                             | 174.78                             | 0.0                                 | 1664.40                             | 0.21                               | 0.21                                | 16525.05                | 4404.54                 | 0.0                      | 41942.79                 | 5.22                    | 5.22                     |
| 2            | 821.72                             | 121.68                             | 0.0                                 | 1549.32                             | 0.44                               | 0.44                                | 24076.28                | 3565.22                 | 0.0                      | 45395.13                 | 12.78                   | 12.78                    |
| 3            | 1037.42                            | 34.02                              | 0.0                                 | 1450.90                             | 1.54                               | 1.54                                | 42534.27                | 1394.70                 | 0.0                      | 59486.83                 | 62.96                   | 62.96                    |
| 4            | 944.14                             | 34.51                              | 0.0                                 | 1596.12                             | 1.24                               | 1.24                                | 38709.55                | 1414.94                 | 0.0                      | 65440.75                 | 50.71                   | 50.71                    |
| 5            | 968.53                             | 34.11                              | 0.0                                 | 1558.89                             | 1.22                               | 1.22                                | 39709.71                | 1398.40                 | 0.0                      | 63914.66                 | 50.11                   | 50.11                    |
| 6            | 865.57                             | 39.99                              | 0.0                                 | 1704.53                             | 3.09                               | 3.09                                | 96337.56                | 4450.77                 | 0.0                      | 189714.50                | 343.91                  | 343.91                   |
| 7            | 861.28                             | 22.50                              | 0.0                                 | 1759.25                             | 3.35                               | 3.35                                | 69677.63                | 1820.29                 | 0.0                      | 142323.00                | 271.41                  | 271.41                   |
| 8            | 935.02                             | 24.23                              | 0.0                                 | 1638.64                             | 2.40                               | 2.40                                | 71248.56                | 1846.20                 | 0.0                      | 124864.56                | 183.05                  | 183.05                   |
| 9            | 975.96                             | 25.65                              | 0.0                                 | 1570.41                             | 2.57                               | 2.57                                | 61778.50                | 1623.74                 | 0.0                      | 99406.81                 | 162.60                  | 162.60                   |
| 10           | 802.97                             | 145.30                             | 0.0                                 | 1513.97                             | 1.08                               | 1.08                                | 23526.95                | 4257.38                 | 0.0                      | 44359.34                 | 31.69                   | 31.69                    |

LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/LK<br>LB FUEL | CO<br>LB/LK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/LK<br>LB FUEL | HC<br>LB/LK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/LK<br>LB FUEL | NO<br>LB/LK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 29.30                          | 5.86                 | 821.72                 | 24076.28             | 4.815                  | 121.68                 | 3565.22              | 0.713                  | 6.44                   | 12.78                | 0.0026                 |
| 6                       | 0.70                    | 111.30                         | 0.56                 | 865.57                 | 96337.56             | 0.482                  | 39.99                  | 4450.77              | 0.022                  | 3.09                   | 343.91               | 0.0017                 |
| 7                       | 5.00                    | 80.90                          | 6.71                 | 861.28                 | 69677.63             | 5.783                  | 22.50                  | 1820.29              | 0.151                  | 3.35                   | 271.41               | 0.0225                 |
| 9                       | 6.00                    | 63.30                          | 6.33                 | 975.96                 | 61778.50             | 6.178                  | 25.65                  | 1623.74              | 0.162                  | 2.57                   | 162.60               | 0.0163                 |
| 10                      | 4.00                    | 29.30                          | 1.96                 | 802.97                 | 23526.95             | 1.576                  | 145.30                 | 4257.38              | 0.285                  | 1.08                   | 31.69                | 0.0021                 |
| TOTAL FOR CYCLE         |                         |                                | 21.424               |                        |                      | 18.834                 |                        |                      | 1.334                  |                        |                      | 0.0452                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.879                  |                        |                      | 0.062                  |                        |                      | 0.0021                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 194 ENGINE TYPE AND MODEL: IO-470-V

SERIAL NUMBER: 170012-7-V-RB

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 971. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 94.00 FINISH 94.00

ATMOSPHERIC PRESSURE: START 30.23 FINISH 30.23

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 34.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IO/F-LOW    |                 | 1            | -0.0          | 24.00                          | 229.00                        | 0.04229           |
| IO/F/TAXI   |                 | 2            | -0.0          | 29.30                          | 339.00                        | 0.06563           |
| RUN UP      |                 | 3            | -0.0          | 42.80                          | 487.00                        | 0.08124           |
| RUN UP-LEAN |                 | 4            | -0.0          | 41.00                          | 481.00                        | 0.07449           |
| RUN UP-RICH |                 | 5            | -0.0          | 41.60                          | 488.00                        | 0.07239           |
| TAKE-OFF    |                 | 6            | -0.0          | 116.00                         | 1364.00                       | 0.08006           |
| CLIMB       |                 | 7            | -0.0          | 87.90                          | 1078.00                       | 0.07672           |
| DESCENT     |                 | 8            | -0.0          | 75.00                          | 883.00                        | 0.07859           |
| APPROACH    |                 | 9            | -0.0          | 63.30                          | 710.00                        | 0.08197           |
| TAXI        |                 | 10           | -0.0          | 29.30                          | 280.00                        | 0.07085           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 404.00                              | -0.00                              | 2.40                     | 4.20                          | 23956.00             | 0.0                 | -0.00                    | -0.00                    | 37.00              | -0.00 | -0.00        |
| 2            | 841.00                              | -0.00                              | 5.40                     | 7.70                          | 10647.00             | 4.00                | -0.00                    | -0.00                    | 33.00              | -0.00 | -0.00        |
| 3            | 1188.00                             | -0.00                              | 8.70                     | 8.40                          | 4658.00              | 62.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1199.00                             | -0.00                              | 7.60                     | 8.20                          | 2995.00              | 42.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1199.00                             | -0.00                              | 7.30                     | 8.00                          | 3327.00              | 45.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1435.00                             | -0.00                              | 7.80                     | 9.10                          | 4714.00              | 115.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1457.00                             | -0.00                              | 6.80                     | 9.60                          | 2884.00              | 87.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 8            | 1390.00                             | -0.00                              | 7.90                     | 8.80                          | 3272.00              | 72.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 9            | 1300.00                             | -0.00                              | 9.30                     | 8.00                          | 3882.00              | 49.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 729.00                              | -0.00                              | 6.60                     | 5.90                          | 26618.00             | 17.00               | -0.00                    | -0.00                    | 38.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 538.99                             | 300.13                             | 0.0                                 | 1482.04                             | 0.0                                | 0.0                                 | 12935.82                | 7395.07                 | 0.0                      | 35568.91                 | 0.0                     | 0.0                      |
| 2            | 770.17                             | 86.97                              | 0.0                                 | 1725.53                             | 0.09                               | 0.09                                | 22566.05                | 2548.21                 | 0.0                      | 50558.11                 | 2.75                    | 2.75                     |
| 3            | 1000.58                            | 30.68                              | 0.0                                 | 1517.93                             | 1.17                               | 1.17                                | 42824.93                | 1313.17                 | 0.0                      | 64967.31                 | 50.13                   | 50.13                    |
| 4            | 953.68                             | 71.52                              | 0.0                                 | 1616.74                             | 0.87                               | 0.87                                | 39100.89                | 882.50                  | 0.0                      | 66286.50                 | 35.49                   | 35.49                    |
| 5            | 943.39                             | 24.62                              | 0.0                                 | 1624.41                             | 0.96                               | 0.96                                | 39244.96                | 1024.37                 | 0.0                      | 67575.50                 | 39.74                   | 39.74                    |
| 6            | 907.11                             | 31.40                              | 0.0                                 | 1662.83                             | 2.20                               | 2.20                                | 105225.19               | 3642.17                 | 0.0                      | 192887.75                | 254.83                  | 254.83                   |
| 7            | 823.18                             | 20.00                              | 0.0                                 | 1825.98                             | 1.73                               | 1.73                                | 72357.69                | 1757.58                 | 0.0                      | 160503.81                | 152.06                  | 152.06                   |
| 8            | 937.32                             | 22.23                              | 0.0                                 | 1640.51                             | 1.40                               | 1.40                                | 70298.63                | 1667.55                 | 0.0                      | 123038.38                | 105.24                  | 105.24                   |
| 9            | 1062.19                            | 75.39                              | 0.0                                 | 1435.64                             | 0.92                               | 0.92                                | 67236.38                | 1607.39                 | 0.0                      | 90876.06                 | 58.19                   | 58.19                    |
| 10           | 879.42                             | 203.13                             | 0.0                                 | 1235.21                             | 0.37                               | 0.37                                | 25766.91                | 5951.68                 | 0.0                      | 36191.68                 | 10.90                   | 10.90                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 29.30                          | 5.86                 | 770.17                 | 22566.05             | 4.513                  | 86.97                  | 2548.21              | 0.510                  | 0.09                   | 2.75                 | 0.0005                 |
| 6                       | 0.30                    | 116.00                         | 0.58                 | 937.11                 | 105225.19            | 0.526                  | 31.40                  | 3642.17              | 0.018                  | 2.20                   | 254.83               | 0.0013                 |
| 7                       | 5.00                    | 87.90                          | 7.30                 | 823.18                 | 72357.69             | 6.006                  | 20.00                  | 1757.58              | 0.146                  | 1.73                   | 152.06               | 0.0126                 |
| 9                       | 6.00                    | 63.30                          | 6.33                 | 1062.19                | 67236.38             | 6.724                  | 25.39                  | 1607.39              | 0.161                  | 0.92                   | 58.19                | 0.0058                 |
| 10                      | 4.00                    | 29.30                          | 1.96                 | 879.42                 | 25766.91             | 1.726                  | 203.13                 | 5951.68              | 0.399                  | 0.37                   | 10.90                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                | 22.029               |                        |                      | 19.495                 |                        |                      | 1.233                  |                        |                      | 0.0210                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.885                  |                        |                      | 0.056                  |                        |                      | 0.0010                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEOVNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 195 ENGINE TYPE AND MODEL: IO-470-V

SERIAL NUMBER: 170012-7-V-RC

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 971. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 96.00 FINISH 96.00

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 31.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 24.00                          | 265.00                        | 0.08153           |
| IDLE/TAXI   |                 | 2            | -0.0          | 29.30                          | 313.00                        | 0.07450           |
| RUN UP      |                 | 3            | -0.0          | 42.20                          | 448.00                        | 0.08272           |
| RUN UP-LEAN |                 | 4            | -0.0          | 41.60                          | 453.00                        | 0.08108           |
| RUN UP-RICH |                 | 5            | -0.0          | 41.60                          | 460.00                        | 0.07984           |
| TAKE-OFF    |                 | 6            | -0.0          | 113.10                         | 1280.00                       | 0.08188           |
| CLIMB       |                 | 7            | -0.0          | 83.80                          | 990.00                        | 0.07451           |
| DESCENT     |                 | 8            | -0.0          | 74.40                          | 898.00                        | 0.07842           |
| APPROACH    |                 | 9            | -0.0          | 58.60                          | 668.00                        | 0.07485           |
| TAXI        |                 | 10           | -0.0          | 29.30                          | 311.00                        | 0.06611           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPHV | NO<br>(DRY)<br>PPHV | NO<br>2<br>(DRY)<br>PPHV | NO<br>X<br>(DRY)<br>PPHV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 740.00                              | -0.00                              | 7.80                     | 7.80                          | 19880.00             | 30.00               | -0.00                    | -0.00                    | 34.00              | -0.00 | -0.00        |
| 2            | 919.00                              | -0.00                              | 6.80                     | 7.50                          | 17551.00             | 44.00               | -0.00                    | -0.00                    | 48.00              | -0.00 | -0.00        |
| 3            | 1132.00                             | -0.00                              | 10.00                    | 7.10                          | 6738.00              | 38.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1256.00                             | -0.00                              | 9.30                     | 7.50                          | 6571.00              | 38.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1222.00                             | -0.00                              | 8.90                     | 7.70                          | 6072.00              | 33.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 8.30                     | 8.60                          | 8235.00              | 76.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 7.10                     | 8.90                          | 5906.00              | 53.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 7.90                     | 8.50                          | 5684.00              | 44.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8.20                     | 7.60                          | 3300.00              | 62.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 6.10                     | 6.50                          | 15888.00             | 44.00               | -0.00                    | -0.00                    | 33.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 495.94                             | 130.78                             | 0.0                                 | 1407.73                             | 0.57                               | 0.57                                | 21502.59                | 3138.76                 | 0.0                      | 33785.40                 | 13.58                   | 13.58                    |
| 2            | 855.65                             | 126.48                             | 0.0                                 | 1482.82                             | 0.91                               | 0.91                                | 25070.62                | 3705.98                 | 0.0                      | 43446.59                 | 26.65                   | 26.65                    |
| 3            | 1136.64                            | 43.86                              | 0.0                                 | 1268.00                             | 0.71                               | 0.71                                | 47966.05                | 1851.01                 | 0.0                      | 53509.43                 | 29.94                   | 29.94                    |
| 4            | 1076.25                            | 43.55                              | 0.0                                 | 1363.73                             | 0.72                               | 0.72                                | 44771.94                | 1811.75                 | 0.0                      | 56731.26                 | 30.05                   | 30.05                    |
| 5            | 1046.92                            | 40.83                              | 0.0                                 | 1420.43                             | 0.64                               | 0.64                                | 43468.52                | 1698.48                 | 0.0                      | 59089.98                 | 26.47                   | 26.47                    |
| 6            | 946.09                             | 53.76                              | 0.0                                 | 1540.24                             | 1.42                               | 1.42                                | 107002.19               | 6080.28                 | 0.0                      | 174201.19                | 160.93                  | 160.93                   |
| 7            | 864.57                             | 41.19                              | 0.0                                 | 1702.82                             | 1.06                               | 1.06                                | 72450.56                | 3451.61                 | 0.0                      | 142695.94                | 88.83                   | 88.83                    |
| 8            | 940.56                             | 38.76                              | 0.0                                 | 1590.08                             | 0.86                               | 0.86                                | 69977.81                | 2683.58                 | 0.0                      | 118301.63                | 64.02                   | 64.02                    |
| 9            | 1027.03                            | 23.47                              | 0.0                                 | 1495.61                             | 1.28                               | 1.28                                | 60183.70                | 1387.15                 | 0.0                      | 87642.48                 | 74.74                   | 74.74                    |
| 10           | 868.53                             | 129.56                             | 0.0                                 | 1454.15                             | 1.03                               | 1.03                                | 25447.98                | 3796.10                 | 0.0                      | 42606.43                 | 30.15                   | 30.15                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/LK<br>LB FUEL | CO<br>LB/LK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/LK<br>LB FUEL | HC<br>LB/LK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/LK<br>LB FUEL | NO<br>LB/LK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 29.30                          | 5.86                 | 855.65                 | 25070.62             | 5.014                  | 126.48                 | 3705.98              | 0.741                  | 0.91                   | 26.65                | 0.0053                 |
| 6                       | 0.30                    | 113.10                         | 0.57                 | 946.09                 | 107002.19            | 0.535                  | 53.76                  | 6080.28              | 0.030                  | 1.42                   | 160.93               | 0.0008                 |
| 7                       | 5.00                    | 83.80                          | 4.96                 | 864.57                 | 72450.56             | 6.013                  | 41.19                  | 3451.61              | 0.286                  | 1.06                   | 88.83                | 0.0074                 |
| 9                       | 4.00                    | 58.60                          | 5.86                 | 1027.03                | 60183.70             | 6.018                  | 23.47                  | 1387.15              | 0.139                  | 1.28                   | 74.74                | 0.0075                 |
| 10                      | 4.00                    | 29.30                          | 1.96                 | 868.53                 | 25447.98             | 1.705                  | 129.56                 | 3796.10              | 0.254                  | 1.03                   | 30.15                | 0.0020                 |
| TOTAL FOR CYCLE         |                         |                                | 21.204               |                        |                      | 19.286                 |                        |                      | 1.451                  |                        |                      | 0.0230                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.910                  |                        |                      | 0.068                  |                        |                      | 0.0011                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 378 ENGINE TYPE AND MODEL: ID-470-VO

SERIAL NUMBER: 149063VO

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 185. MRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.50 FINISH 90.00

ATMOSPHERIC PRESSURE: START 30.06 FINISH 30.06

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 46.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 19.30                          | 232.00                        | 0.05971           |
| IDLE/TAXI   |                 | 2            | -0.0          | 26.40                          | 359.00                        | 0.06269           |
| RUN UP      |                 | 3            | -0.0          | 47.50                          | 601.00                        | 0.07381           |
| RUN UP-LEAN |                 | 4            | -0.0          | 24.60                          | 331.00                        | 0.06003           |
| RUN UP-RICH |                 | 5            | -0.0          | 51.00                          | 689.00                        | 0.06716           |
| TAKE-OFF    |                 | 6            | -0.0          | 96.70                          | 1248.00                       | 0.07558           |
| CLIMB       |                 | 7            | -0.0          | 77.40                          | 988.00                        | 0.07500           |
| DESCENT     |                 | 8            | -0.0          | 70.30                          | 880.00                        | 0.07663           |
| APPROACH    |                 | 9            | -0.0          | 59.40                          | 713.00                        | 0.07095           |
| TAXI        |                 | 10           | -0.0          | 24.60                          | 321.00                        | 0.07027           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 673.00                              | -0.00                              | 3.50                     | 8.00                          | 11981.00             | 15.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 2            | 874.00                              | -0.00                              | 3.00                     | 10.50                         | 2105.00              | 37.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 3            | 1199.00                             | -0.00                              | 5.70                     | 10.20                         | 2051.00              | 167.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1256.00                             | -0.00                              | 3.80                     | 11.00                         | 1079.00              | 120.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1233.00                             | -0.00                              | 3.60                     | 11.00                         | 1187.00              | 108.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 5.30                     | 10.90                         | 3454.00              | 688.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 5.60                     | 10.60                         | 1943.00              | 589.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1356.00                             | -0.00                              | 6.30                     | 10.20                         | 2159.00              | 454.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 9            | 1278.00                             | -0.00                              | 7.70                     | 9.20                          | 2375.00              | 216.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 886.00                              | -0.00                              | 4.60                     | 10.50                         | 2591.00              | 55.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 556.84                             | 109.17                             | 0.0                                 | 1999.82                             | 0.39                               | 0.39                                | 10747.02                | 2106.97                 | 0.0                      | 38596.54                 | 7.57                    | 7.57                     |
| 2            | 442.05                             | 17.76                              | 0.0                                 | 2430.95                             | 0.90                               | 0.90                                | 11670.07                | 468.97                  | 0.0                      | 64177.09                 | 23.64                   | 23.64                    |
| 3            | 715.01                             | 14.73                              | 0.0                                 | 2010.37                             | 3.44                               | 3.44                                | 33963.04                | 699.91                  | 0.0                      | 95492.75                 | 163.44                  | 163.44                   |
| 4            | 514.95                             | 8.37                               | 0.0                                 | 2342.16                             | 2.67                               | 2.67                                | 12667.88                | 206.01                  | 0.0                      | 57617.08                 | 65.71                   | 65.71                    |
| 5            | 494.12                             | 9.33                               | 0.0                                 | 2372.27                             | 2.43                               | 2.43                                | 25200.25                | 475.88                  | 0.0                      | 120985.56                | 124.18                  | 124.18                   |
| 6            | 647.14                             | 24.15                              | 0.0                                 | 2091.17                             | 13.80                              | 13.80                               | 62578.69                | 2335.71                 | 0.0                      | 202216.00                | 1334.32                 | 1334.32                  |
| 7            | 690.08                             | 13.71                              | 0.0                                 | 2052.36                             | 11.92                              | 11.92                               | 53411.85                | 1061.37                 | 0.0                      | 158852.38                | 922.75                  | 922.75                   |
| 8            | 761.40                             | 14.94                              | 0.0                                 | 1936.92                             | 9.01                               | 9.01                                | 53526.38                | 1050.57                 | 0.0                      | 136165.06                | 633.58                  | 633.58                   |
| 9            | 907.71                             | 16.03                              | 0.0                                 | 1704.04                             | 4.18                               | 4.18                                | 54280.79                | 958.88                  | 0.0                      | 101901.69                | 250.11                  | 250.11                   |
| 10           | 605.05                             | 19.52                              | 0.0                                 | 2170.02                             | 1.19                               | 1.19                                | 14884.31                | 480.16                  | 0.0                      | 53382.45                 | 29.23                   | 29.23                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 26.40                          | 5.28                 | 442.05                 | 11670.07             | 2.334                  | 17.76                  | 468.97               | 0.094                  | 0.90                   | 23.64                | 0.0047                 |
| 6                       | 0.30                    | 96.70                          | 0.48                 | 647.14                 | 62578.69             | 0.313                  | 24.15                  | 2335.71              | 0.012                  | 13.80                  | 1334.32              | 0.0067                 |
| 7                       | 5.00                    | 77.40                          | 6.42                 | 690.08                 | 53411.85             | 4.433                  | 13.71                  | 1061.37              | 0.088                  | 11.92                  | 922.75               | 0.0766                 |
| 9                       | 6.00                    | 59.80                          | 5.98                 | 907.71                 | 54280.79             | 5.428                  | 16.03                  | 958.88               | 0.096                  | 4.18                   | 250.11               | 0.0250                 |
| 10                      | 4.00                    | 24.60                          | 1.65                 | 605.05                 | 14884.31             | 0.997                  | 19.52                  | 480.16               | 0.032                  | 1.19                   | 29.23                | 0.0020                 |
| TOTAL FOR CYCLE         |                         |                                | 19.816               |                        |                      | 13.505                 |                        |                      | 0.322                  |                        |                      | 0.1150                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.682                  |                        |                      | 0.016                  |                        |                      | 0.0058                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 379 ENGINE TYPE AND MODEL: IO-470-V0

SERIAL NUMBER: 149063V0A

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 185. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 90.50

ATMOSPHERIC PRESSURE: START 30.06 FINISH 30.06

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 45.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 21.10                          | 222.00                        | 0.06958           |
| IDLE/TAXI   |                 | 2            | -0.0          | 26.40                          | 343.00                        | 0.07121           |
| RUN UP      |                 | 3            | -0.0          | 49.20                          | 617.00                        | 0.07754           |
| RUN UP-LEAN |                 | 4            | -0.0          | 26.40                          | 341.00                        | 0.07571           |
| RUN UP-RICH |                 | 5            | -0.0          | 49.20                          | 643.00                        | 0.07556           |
| TAKE-OFF    |                 | 6            | -0.0          | 123.10                         | 1571.00                       | 0.07734           |
| CLIMB       |                 | 7            | -0.0          | 94.90                          | 1200.00                       | 0.07631           |
| DESCENT     |                 | 8            | -0.0          | 77.40                          | 931.00                        | 0.07966           |
| APPROACH    |                 | 9            | -0.0          | 63.30                          | 742.00                        | 0.08141           |
| TAXI        |                 | 10           | -0.0          | 24.60                          | 247.00                        | 0.08027           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 605.00                              | -0.00                              | 4.90                     | 7.60                          | 25132.00             | 15.00               | -0.00                    | -0.00                    | 25.00              | -0.00 | -0.00        |
| 2            | 863.00                              | -0.00                              | 4.50                     | 10.60                         | 4726.00              | 52.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 3            | 975.00                              | -0.00                              | 6.30                     | 10.40                         | 2309.00              | 259.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1043.00                             | -0.00                              | 5.30                     | 11.10                         | 1879.00              | 157.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 975.00                              | -0.00                              | 5.10                     | 11.30                         | 1718.00              | 162.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1256.00                             | -0.00                              | 5.60                     | 10.90                         | 4726.00              | 679.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1233.00                             | -0.00                              | 6.00                     | 10.50                         | 2148.00              | 314.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1177.00                             | -0.00                              | 7.60                     | 9.50                          | 2148.00              | 226.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 8.40                     | 9.00                          | 2524.00              | 231.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 314.00                              | -0.00                              | 7.00                     | 7.60                          | 27065.00             | 42.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 659.36                             | 193.69                             | 0.0                                 | 1606.87                             | 0.33                               | 0.33                                | 13912.55                | 4086.80                 | 0.0                      | 33904.91                 | 7.00                    | 7.00                     |
| 2            | 583.79                             | 35.11                              | 0.0                                 | 2160.65                             | 1.11                               | 1.11                                | 15411.92                | 927.01                  | 0.0                      | 57041.21                 | 29.25                   | 29.25                    |
| 3            | 751.73                             | 15.78                              | 0.0                                 | 1949.82                             | 5.08                               | 5.08                                | 36985.15                | 776.35                  | 0.0                      | 95930.88                 | 249.75                  | 249.75                   |
| 4            | 645.49                             | 13.11                              | 0.0                                 | 2124.08                             | 3.14                               | 3.14                                | 17040.80                | 346.01                  | 0.0                      | 56075.80                 | 82.92                   | 82.92                    |
| 5            | 621.73                             | 12.00                              | 0.0                                 | 2164.46                             | 3.24                               | 3.24                                | 30589.14                | 590.15                  | 0.0                      | 106491.25                | 159.60                  | 159.60                   |
| 6            | 666.56                             | 32.22                              | 0.0                                 | 2038.54                             | 13.28                              | 13.28                               | 82053.94                | 3965.97                 | 0.0                      | 250943.75                | 1634.19                 | 1634.19                  |
| 7            | 725.19                             | 14.87                              | 0.0                                 | 1994.01                             | 6.23                               | 6.23                                | 68820.50                | 1411.06                 | 0.0                      | 189231.88                | 591.58                  | 591.58                   |
| 8            | 886.74                             | 14.35                              | 0.0                                 | 1741.59                             | 4.33                               | 4.33                                | 68633.88                | 1110.98                 | 0.0                      | 134799.06                | 335.24                  | 335.24                   |
| 9            | 961.34                             | 16.54                              | 0.0                                 | 1618.37                             | 4.34                               | 4.34                                | 60852.84                | 1047.22                 | 0.0                      | 102442.94                | 274.87                  | 274.87                   |
| 10           | 817.13                             | 180.94                             | 0.0                                 | 1393.94                             | 0.81                               | 0.81                                | 20101.36                | 4451.24                 | 0.0                      | 34290.91                 | 19.81                   | 19.81                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 26.40                          | 5.28                 | 583.79                 | 15411.92             | 3.082                  | 35.11                  | 927.01               | 0.185                  | 1.11                   | 29.25                | 0.0059                 |
| 6                       | 0.30                    | 123.10                         | 0.62                 | 666.56                 | 82053.94             | 0.410                  | 32.22                  | 3965.97              | 0.020                  | 13.28                  | 1634.19              | 0.0082                 |
| 7                       | 5.00                    | 94.90                          | 7.88                 | 725.19                 | 68820.50             | 5.712                  | 14.87                  | 1411.06              | 0.117                  | 6.23                   | 591.58               | 0.0491                 |
| 9                       | 6.00                    | 63.30                          | 6.33                 | 961.34                 | 60852.84             | 6.085                  | 16.54                  | 1047.22              | 0.105                  | 4.34                   | 274.87               | 0.0275                 |
| 10                      | 4.00                    | 24.60                          | 1.65                 | 817.13                 | 20101.36             | 1.347                  | 180.94                 | 4451.24              | 0.298                  | 0.81                   | 19.81                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 21.750               |                        |                      | 16.637                 |                        |                      | 0.725                  |                        |                      | 0.0919                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.765                  |                        |                      | 0.033                  |                        |                      | 0.0042                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 38D ENGINE TYPE AND MODEL: ID-470-VO SERIAL NUMBER: 149063VDB

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 185. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 81.50 FINISH 83.00

ATMOSPHERIC PRESSURE: START 30.04 FINISH 30.04

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 61.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 21.10                          | 218.00                        | 0.07786           |
| IDLE/TAXI   |                 | 2            | -0.0          | 24.60                          | 328.00                        | 0.07164           |
| RUN UP      |                 | 3            | -0.0          | 49.20                          | 615.00                        | 0.07383           |
| RUN UP-LEAN |                 | 4            | -0.0          | 29.90                          | 386.00                        | 0.07210           |
| RUN UP-RICH |                 | 5            | -0.0          | 49.20                          | 643.00                        | 0.07041           |
| TAKE-OFF    |                 | 6            | -0.0          | 107.20                         | 1354.00                       | 0.07402           |
| CLIMB       |                 | 7            | -0.0          | 80.90                          | 1038.00                       | 0.07367           |
| DESCENT     |                 | 8            | -0.0          | 68.60                          | 639.00                        | 0.07595           |
| APPROACH    |                 | 9            | -0.0          | 59.80                          | 704.00                        | 0.07878           |
| TAXI        |                 | 10           | -0.0          | 24.60                          | 245.00                        | 0.08299           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 6.40                     | 7.90                          | 25132.00             | 25.00               | -0.00                    | -0.00                    | 31.00              | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 3.80                     | 11.40                         | 5263.00              | 177.00              | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 6.00                     | 9.80                          | 2792.00              | 226.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 5.00                     | 10.50                         | 2578.00              | 168.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | -0.00                               | -0.00                              | 4.70                     | 10.70                         | 22.50                | 158.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 5.70                     | 10.10                         | 3437.00              | 148.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 5.40                     | 10.50                         | 1987.00              | 309.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 6.80                     | 9.50                          | 2148.00              | 202.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8.00                     | 8.80                          | 2685.00              | 202.00              | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 7.80                     | 7.50                          | 25776.00             | 27.00               | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 769.01                             | 172.95                             | 0.0                                 | 1491.48                             | 0.49                               | 0.49                                | 16226.07                | 3649.27                 | 0.0                      | 31470.14                 | 10.41                   | 10.41                    |
| 2            | 488.16                             | 38.72                              | 0.0                                 | 2301.01                             | 3.73                               | 3.73                                | 12008.63                | 952.55                  | 0.0                      | 56604.81                 | 91.88                   | 91.88                    |
| 3            | 753.86                             | 20.09                              | 0.0                                 | 1934.65                             | 4.66                               | 4.66                                | 37089.73                | 988.47                  | 0.0                      | 95184.63                 | 229.47                  | 229.47                   |
| 4            | 641.03                             | 18.93                              | 0.0                                 | 2115.11                             | 3.54                               | 3.54                                | 19166.70                | 565.99                  | 0.0                      | 63241.88                 | 105.78                  | 105.78                   |
| 5            | 616.47                             | 0.17                               | 0.0                                 | 2205.16                             | 3.40                               | 3.40                                | 30330.55                | 8.32                    | 0.0                      | 108493.75                | 167.48                  | 167.48                   |
| 6            | 713.30                             | 24.63                              | 0.0                                 | 1985.91                             | 3.04                               | 3.04                                | 76465.94                | 2640.69                 | 0.0                      | 212888.94                | 326.12                  | 326.12                   |
| 7            | 677.65                             | 14.29                              | 0.0                                 | 2070.33                             | 6.37                               | 6.37                                | 54821.76                | 1155.32                 | 0.0                      | 167489.19                | 515.27                  | 515.27                   |
| 8            | 411.84                             | 15.05                              | 0.0                                 | 1825.96                             | 4.06                               | 4.06                                | 57063.87                | 1032.36                 | 0.0                      | 125260.50                | 278.41                  | 278.41                   |
| 9            | 446.88                             | 19.20                              | 0.0                                 | 1636.54                             | 3.93                               | 3.93                                | 56623.63                | 1088.42                 | 0.0                      | 97865.19                 | 234.84                  | 234.84                   |
| 10           | 981.43                             | 166.82                             | 0.0                                 | 1331.66                             | 0.50                               | 0.50                                | 21683.12                | 4103.82                 | 0.0                      | 32758.71                 | 12.33                   | 12.33                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 24.60                          | 4.92                 | 488.16                 | 12008.63             | 2.402                  | 38.72                  | 952.55               | 0.191                  | 3.73                   | 91.88                | 0.0184                 |
| 6                       | 0.30                    | 107.20                         | 0.54                 | 713.30                 | 76465.94             | 0.382                  | 24.63                  | 2640.69              | 0.013                  | 3.04                   | 326.12               | 0.0016                 |
| 7                       | 5.00                    | 80.90                          | 6.71                 | 677.65                 | 54821.76             | 4.550                  | 14.28                  | 1155.32              | 0.096                  | 6.37                   | 515.27               | 0.0428                 |
| 9                       | 6.00                    | 59.80                          | 5.98                 | 446.88                 | 56623.63             | 5.662                  | 18.20                  | 1088.42              | 0.109                  | 3.93                   | 234.84               | 0.0235                 |
| 10                      | 4.00                    | 24.60                          | 1.65                 | 881.43                 | 21683.12             | 1.453                  | 166.82                 | 4103.82              | 0.275                  | 0.50                   | 12.33                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 19.799               |                        |                      | 14.449                 |                        |                      | 0.683                  |                        |                      | 0.0871                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.730                  |                        |                      | 0.035                  |                        |                      | 0.0044                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 381 ENGINE TYPE AND MODEL: IO-470-VO SERIAL NUMBER: 49055VO  
RATED HORSEPOWER: 280.

ENGINE TOTAL TIME: 105. MRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 30.04 FINISH 30.04

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 57.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00 FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>P/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 10.50                          | 102.00                        | 0.07101           |
| IDLE/TAXI   |                 | 2            | -0.0          | 17.40                          | 199.00                        | 0.08006           |
| RUN UP      |                 | 3            | -0.0          | 31.60                          | 401.00                        | 0.07535           |
| RUN UP-LEAN |                 | 4            | -0.0          | 29.90                          | 396.00                        | 0.07403           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 420.00                        | 0.07382           |
| TAKE-OFF    |                 | 6            | -0.0          | 110.80                         | 1409.00                       | 0.07745           |
| CLIMB       |                 | 7            | -0.0          | 80.90                          | 1023.00                       | 0.07430           |
| DESCENT     |                 | 8            | -0.0          | 70.30                          | 850.00                        | 0.08143           |
| APPROACH    |                 | 9            | -0.0          | 51.00                          | 598.00                        | 0.08219           |
| TAXI        |                 | 10           | -0.0          | 14.10                          | 136.00                        | 0.08403           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 482.00                              | -0.00                              | 4.80                     | 7.00                          | 34824.00             | 78.00               | -0.00                    | -0.00                    | 60.00              | -0.00 | -0.00        |
| 2            | 762.00                              | -0.00                              | 7.40                     | 8.90                          | 10577.00             | 53.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 3            | 1199.00                             | -0.00                              | 5.80                     | 10.40                         | 2549.00              | 249.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1256.00                             | -0.00                              | 4.60                     | 11.50                         | 1519.00              | 176.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1222.00                             | -0.00                              | 4.50                     | 11.50                         | 2061.00              | 197.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1446.00                             | -0.00                              | 5.70                     | 10.70                         | 5370.00              | 539.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1480.00                             | -0.00                              | 5.80                     | 10.20                         | 2115.00              | 373.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 7.70                     | 9.80                          | 2224.00              | 192.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8.50                     | 9.10                          | 2278.00              | 171.00              | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 8.90                     | 7.40                          | 28640.00             | 21.00               | -0.00                    | -0.00                    | 44.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 634.53                             | 263.65                             | 0.0                                 | 1453.94                             | 1.69                               | 1.69                                | 6662.55                 | 2768.37                 | 0.0                      | 15266.37                 | 17.78                   | 17.78                    |
| 2            | 861.27                             | 70.50                              | 0.0                                 | 1627.56                             | 1.01                               | 1.01                                | 15158.42                | 1240.88                 | 0.0                      | 28645.09                 | 17.83                   | 17.83                    |
| 3            | 712.09                             | 17.92                              | 0.0                                 | 2006.22                             | 5.02                               | 5.02                                | 22502.01                | 566.38                  | 0.0                      | 63396.50                 | 158.68                  | 158.68                   |
| 4            | 571.81                             | 10.81                              | 0.0                                 | 2246.12                             | 3.59                               | 3.59                                | 17097.24                | 323.35                  | 0.0                      | 67159.06                 | 107.45                  | 107.45                   |
| 5            | 560.97                             | 14.71                              | 0.0                                 | 2252.47                             | 4.03                               | 4.03                                | 17726.48                | 464.98                  | 0.0                      | 71178.06                 | 127.47                  | 127.47                   |
| 6            | 679.89                             | 36.68                              | 0.0                                 | 2005.34                             | 10.56                              | 10.56                               | 75332.00                | 4064.66                 | 0.0                      | 222191.31                | 1170.08                 | 1170.08                  |
| 7            | 722.78                             | 15.10                              | 0.0                                 | 1997.18                             | 7.63                               | 7.63                                | 58472.95                | 1221.19                 | 0.0                      | 161571.75                | 617.67                  | 617.67                   |
| 8            | 877.75                             | 14.52                              | 0.0                                 | 1755.27                             | 3.60                               | 3.60                                | 61705.70                | 1020.74                 | 0.0                      | 123395.38                | 252.73                  | 252.73                   |
| 9            | 963.21                             | 14.78                              | 0.0                                 | 1620.26                             | 3.18                               | 3.18                                | 49123.95                | 754.00                  | 0.0                      | 82633.00                 | 162.33                  | 162.33                   |
| 10           | 938.22                             | 172.92                             | 0.0                                 | 1225.71                             | 0.36                               | 0.36                                | 13228.94                | 2438.11                 | 0.0                      | 17282.44                 | 5.13                    | 5.13                     |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 17.60                          | 3.52                 | 861.27                 | 15158.42             | 3.032                  | 70.50                  | 1240.88              | 0.248                  | 1.01                   | 17.83                | 0.0036                 |
| 6                       | 0.30                    | 110.00                         | 0.55                 | 679.89                 | 75332.00             | 0.377                  | 36.68                  | 4064.66              | 0.020                  | 10.56                  | 1170.08              | 0.0059                 |
| 7                       | 5.00                    | 80.90                          | 6.71                 | 722.78                 | 58472.95             | 4.853                  | 15.10                  | 1221.19              | 0.101                  | 7.63                   | 617.67               | 0.0513                 |
| 9                       | 6.00                    | 51.00                          | 5.10                 | 963.21                 | 49123.95             | 4.912                  | 14.78                  | 754.00               | 0.075                  | 3.18                   | 162.33               | 0.0162                 |
| 10                      | 4.00                    | 14.10                          | 0.94                 | 938.22                 | 13228.94             | 0.886                  | 172.92                 | 2438.11              | 0.163                  | 0.36                   | 5.13                 | 0.0003                 |
| TOTAL FOR CYCLE         |                         |                                | 16.833               |                        |                      | 14.060                 |                        |                      | 0.609                  |                        |                      | 0.0773                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.835                  |                        |                      | 0.036                  |                        |                      | 0.0046                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 382 ENGINE TYPE AND MODEL: IO-470-VO

SERIAL NUMBER: 49055VOA

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 185. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 90.00

ATMOSPHERIC PRESSURE: START 30.05 FINISH 30.04

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 55.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARR.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 10.50                          | 96.00                         | 0.06977           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.80                          | 175.00                        | 0.08185           |
| RUN UP      |                 | 3            | -0.0          | 33.40                          | 384.00                        | 0.08142           |
| RUN UP-LEAN |                 | 4            | -0.0          | 26.40                          | 323.00                        | 0.06490           |
| RUN UP-RICH |                 | 5            | -0.0          | 31.60                          | 383.00                        | 0.07837           |
| TAKE-OFF    |                 | 6            | -0.0          | 98.40                          | 124.10                        | 0.07846           |
| CLIMB       |                 | 7            | -0.0          | 77.40                          | 967.00                        | 0.07757           |
| DESCENT     |                 | 8            | -0.0          | 63.30                          | 756.00                        | 0.07980           |
| APPROACH    |                 | 9            | -0.0          | 51.00                          | 592.00                        | 0.08055           |
| TAXI        |                 | 10           | -0.0          | 15.80                          | 146.00                        | 0.08701           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 482.00                              | -0.00                              | 3.50                     | 6.90                          | 46144.00             | 185.00              | -0.00                    | -0.00                    | 40.00              | -0.00 | -0.00        |
| 2            | 762.00                              | -0.00                              | 7.60                     | 8.80                          | 13358.00             | 36.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 3            | 1099.00                             | -0.00                              | 8.70                     | 8.50                          | 4129.00              | 68.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1121.00                             | -0.00                              | 6.90                     | 6.70                          | 3373.00              | 73.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1143.00                             | -0.00                              | 7.20                     | 9.50                          | 3373.00              | 68.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1412.00                             | -0.00                              | 6.00                     | 10.60                         | 5478.00              | 473.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1435.00                             | -0.00                              | 6.40                     | 10.30                         | 2294.00              | 263.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1334.00                             | -0.00                              | 7.80                     | 9.30                          | 2294.00              | 200.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 1256.00                             | -0.00                              | 8.50                     | 8.70                          | 2402.00              | 146.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 10           | 471.00                              | -0.00                              | 8.40                     | 6.80                          | 34811.00             | 19.00               | -0.00                    | -0.00                    | 45.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 470.94                             | 355.59                             | 0.0                                 | 1458.75                             | 4.09                               | 4.09                                | 4944.82                 | 3733.74                 | 0.0                      | 15316.88                 | 42.93                   | 42.93                    |
| 2            | 865.69                             | 87.14                              | 0.0                                 | 1574.97                             | 0.67                               | 0.67                                | 13677.97                | 1376.88                 | 0.0                      | 24884.49                 | 10.64                   | 10.64                    |
| 3            | 997.91                             | 27.12                              | 0.0                                 | 1531.89                             | 1.28                               | 1.28                                | 33330.09                | 405.96                  | 0.0                      | 51165.14                 | 42.79                   | 42.79                    |
| 4            | 1000.17                            | 28.00                              | 0.0                                 | 1525.94                             | 1.74                               | 1.74                                | 26404.37                | 739.25                  | 0.0                      | 40284.68                 | 45.88                   | 45.88                    |
| 5            | 853.76                             | 22.91                              | 0.0                                 | 1769.96                             | 1.32                               | 1.32                                | 26978.65                | 723.85                  | 0.0                      | 55930.65                 | 41.85                   | 41.85                    |
| 6            | 706.88                             | 36.96                              | 0.0                                 | 1962.17                             | 9.15                               | 9.15                                | 69556.75                | 3637.10                 | 0.0                      | 193077.75                | 900.68                  | 900.68                   |
| 7            | 743.73                             | 15.68                              | 0.0                                 | 1931.24                             | 5.16                               | 5.16                                | 59112.73                | 1213.50                 | 0.0                      | 149477.67                | 399.00                  | 399.00                   |
| 8            | 909.31                             | 15.32                              | 0.0                                 | 1703.49                             | 3.83                               | 3.83                                | 57559.41                | 969.53                  | 0.0                      | 107830.81                | 242.42                  | 242.42                   |
| 9            | 984.62                             | 15.94                              | 0.0                                 | 1583.46                             | 2.78                               | 2.78                                | 50215.70                | 812.72                  | 0.0                      | 80756.56                 | 141.68                  | 141.68                   |
| 10           | 908.40                             | 215.61                             | 0.0                                 | 1155.44                             | 0.34                               | 0.34                                | 14352.78                | 3406.58                 | 0.0                      | 18255.92                 | 5.33                    | 5.33                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.80                          | 3.16                 | 865.69                 | 13677.97             | 2.736                  | 87.14                  | 1376.88              | 0.275                  | 0.67                   | 10.64                | 0.0021                 |
| 4                       | 0.30                    | 98.40                          | 0.49                 | 706.88                 | 69556.75             | 0.348                  | 36.96                  | 3637.10              | 0.018                  | 9.15                   | 900.68               | 0.0045                 |
| 7                       | 5.00                    | 77.40                          | 6.42                 | 763.73                 | 59112.73             | 4.906                  | 15.68                  | 1213.50              | 0.101                  | 5.16                   | 399.00               | 0.0331                 |
| 9                       | 6.00                    | 51.00                          | 5.10                 | 984.62                 | 50215.70             | 5.022                  | 15.94                  | 812.72               | 0.081                  | 2.78                   | 141.68               | 0.0142                 |
| 10                      | 4.00                    | 15.80                          | 1.06                 | 908.40                 | 14352.78             | 0.962                  | 215.61                 | 3406.58              | 0.228                  | 0.34                   | 5.33                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 16.235               |                        |                      | 13.973                 |                        |                      | 0.704                  |                        |                      | 0.0543                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.861                  |                        |                      | 0.043                  |                        |                      | 0.0033                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 363 ENGINE TYPE AND MODEL: IO-470-VO

SERIAL NUMBER: 49055V08

RATED HORSEPOWER: 260.

ENGINE TOTAL TIME: 185. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.50 FINISH 78.00

ATMOSPHERIC PRESSURE: START 30.04 FINISH 30.04

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.04

RELATIVE HUMIDITY: 168.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.30                          | 141.00                        | 0.04616           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.80                          | 213.00                        | 0.06840           |
| RUN UP      |                 | 3            | -0.0          | 33.40                          | 397.00                        | 0.07928           |
| RUN UP-LEAN |                 | 4            | -0.0          | 26.40                          | 330.00                        | 0.07603           |
| RUN UP-RICH |                 | 5            | -0.0          | 28.10                          | 329.00                        | 0.07679           |
| TAKE-OFF    |                 | 6            | -0.0          | 102.00                         | 1282.00                       | 0.07902           |
| CLIMB       |                 | 7            | -0.0          | 72.10                          | 888.00                        | 0.07823           |
| DESCENT     |                 | 8            | -0.0          | 63.30                          | 749.00                        | 0.07996           |
| APPROACH    |                 | 9            | -0.0          | 49.20                          | 579.00                        | 0.08051           |
| TAXI        |                 | 10           | -0.0          | 15.80                          | 198.00                        | 0.07049           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 1.30                     | 6.70                          | 19332.00             | 27.00               | -0.00                    | -0.00                    | 32.00              | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 3.50                     | 11.10                         | 3974.00              | 63.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 7.80                     | 9.10                          | 3007.00              | 114.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 6.20                     | 10.10                         | 2792.00              | 96.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | -0.00                               | -0.00                              | 6.50                     | 10.00                         | 2363.00              | 90.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1569.00                             | -0.00                              | 6.10                     | 10.60                         | 5692.00              | 497.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1424.00                             | -0.00                              | 6.80                     | 10.00                         | 2470.00              | 215.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 8            | 1368.00                             | -0.00                              | 8.00                     | 9.10                          | 2470.00              | 167.00              | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 9            | 1300.00                             | -0.00                              | 8.20                     | 9.00                          | 2578.00              | 160.00              | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 10           | 762.00                              | -0.00                              | 3.80                     | 10.50                         | 11116.00             | 50.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 264.40                             | 225.18                             | 0.0                                 | 2141.04                             | 0.90                               | 0.90                                | 3252.08                 | 2769.74                 | 0.0                      | 26334.82                 | 11.09                   | 11.09                    |
| 2            | 471.47                             | 30.66                              | 0.0                                 | 2349.35                             | 1.39                               | 1.39                                | 7449.22                 | 484.41                  | 0.0                      | 37119.69                 | 22.02                   | 22.02                    |
| 3            | 916.12                             | 20.23                              | 0.0                                 | 1679.33                             | 2.20                               | 2.20                                | 30598.25                | 675.59                  | 0.0                      | 56089.52                 | 73.46                   | 73.46                    |
| 4            | 755.49                             | 19.48                              | 0.0                                 | 1933.74                             | 1.92                               | 1.92                                | 19944.98                | 514.40                  | 0.0                      | 51050.69                 | 50.73                   | 50.73                    |
| 5            | 784.61                             | 16.34                              | 0.0                                 | 1896.62                             | 1.78                               | 1.78                                | 22047.62                | 459.05                  | 0.0                      | 53295.03                 | 50.14                   | 50.14                    |
| 6            | 713.61                             | 38.14                              | 0.0                                 | 1948.38                             | 9.55                               | 9.55                                | 72787.94                | 3889.91                 | 0.0                      | 198734.75                | 974.11                  | 974.11                   |
| 7            | 805.87                             | 16.76                              | 0.0                                 | 1862.05                             | 4.19                               | 4.19                                | 58102.92                | 1208.73                 | 0.0                      | 134254.00                | 301.75                  | 301.75                   |
| 8            | 911.68                             | 16.47                              | 0.0                                 | 1665.16                             | 3.19                               | 3.19                                | 58975.40                | 1042.85                 | 0.0                      | 105404.75                | 202.22                  | 202.22                   |
| 9            | 948.91                             | 17.09                              | 0.0                                 | 1636.41                             | 3.04                               | 3.04                                | 46686.49                | 840.63                  | 0.0                      | 80511.50                 | 149.63                  | 149.63                   |
| 10           | 498.12                             | 83.45                              | 0.0                                 | 2162.63                             | 1.08                               | 1.08                                | 7870.36                 | 1318.57                 | 0.0                      | 34169.49                 | 17.01                   | 17.01                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.80                          | 3.16                 | 471.47                 | 7449.22              | 1.490                  | 30.66                  | 484.41               | 0.097                  | 1.39                   | 22.02                | 0.0044                 |
| 6                       | 0.30                    | 102.00                         | 0.51                 | 713.61                 | 72787.94             | 0.364                  | 39.14                  | 3889.91              | 0.019                  | 9.55                   | 974.11               | 0.0049                 |
| 7                       | 5.00                    | 72.10                          | 5.98                 | 805.87                 | 58102.92             | 4.823                  | 16.76                  | 1208.73              | 0.100                  | 4.19                   | 301.75               | 0.0250                 |
| 9                       | 6.00                    | 49.20                          | 4.92                 | 948.91                 | 46686.49             | 4.669                  | 17.09                  | 840.63               | 0.084                  | 3.04                   | 149.63               | 0.0150                 |
| 10                      | 4.00                    | 15.80                          | 1.06                 | 498.12                 | 7870.36              | 0.527                  | 83.45                  | 1318.57              | 0.088                  | 1.08                   | 17.01                | 0.0011                 |
| TOTAL FOR CYCLE         |                         |                                | 15.633               |                        |                      | 11.872                 |                        |                      | 0.389                  |                        |                      | 0.0504                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.759                  |                        |                      | 0.025                  |                        |                      | 0.0032                 |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 163 ENGINE TYPE AND MODEL: D-470-R

SERIAL NUMBER: 203247-TORA

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: 181. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.50 FINISH 89.00

ATMOSPHERIC PRESSURE: START 29.09 FINISH 29.09

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 41.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 10.60                          | 115.00                        | 0.07780           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.00                          | 181.00                        | 0.07260           |
| RUN UP      |                 | 3            | -0.0          | 35.50                          | 470.00                        | 0.07132           |
| RUN UP-LEAN |                 | 4            | -0.0          | 35.50                          | 463.00                        | 0.07135           |
| RUN UP-RICH |                 | 5            | -0.0          | 35.50                          | 467.00                        | 0.07131           |
| TAKE-OFF    |                 | 6            | -0.0          | 108.80                         | 1253.00                       | 0.08003           |
| CLIMB       |                 | 7            | -0.0          | 101.00                         | 1330.00                       | 0.07176           |
| DESCENT     |                 | 8            | -0.0          | 57.40                          | 751.00                        | 0.07180           |
| DESCENT     | ON              | 8            | -0.0          | 49.60                          | 508.00                        | 0.08559           |
| APPROACH    |                 | 9            | -0.0          | 44.80                          | 571.00                        | 0.07346           |
| TAXI        |                 | 10           | -0.0          | 12.40                          | 153.00                        | 0.07402           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 8.30                     | 7.40                          | 10493.00             | 16.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 6.80                     | 8.70                          | 2294.00              | 48.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 4.70                     | 10.80                         | 1089.00              | 169.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 5.10                     | 10.40                         | 860.00               | 99.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | -0.00                               | -0.00                              | 4.90                     | 10.60                         | 917.00               | 82.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 8.80                     | 8.30                          | 1950.00              | 140.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 4.90                     | 10.70                         | 975.00               | 199.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 5.00                     | 10.60                         | 975.00               | 169.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 11.60                    | 6.40                          | 3211.00              | 21.00               | -0.00                    | -0.00                    | 1.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 5.90                     | 10.00                         | 1147.00              | 124.00              | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 6.50                     | 9.40                          | 1892.00              | 32.00               | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1001.11                            | 72.49                              | 0.0                                 | 1402.41                             | 0.32                               | 0.32                                | 10611.80                | 768.34                  | 0.0                      | 14865.55                 | 3.36                    | 3.36                     |
| 2            | 873.37                             | 16.87                              | 0.0                                 | 1755.69                             | 1.01                               | 1.01                                | 13100.56                | 253.12                  | 0.0                      | 26335.29                 | 15.19                   | 15.19                    |
| 3            | 608.31                             | 8.07                               | 0.0                                 | 2196.30                             | 3.59                               | 3.59                                | 21595.12                | 286.57                  | 0.0                      | 77968.63                 | 127.55                  | 127.55                   |
| 4            | 661.05                             | 6.38                               | 0.0                                 | 2118.06                             | 2.11                               | 2.11                                | 23467.44                | 226.64                  | 0.0                      | 75191.19                 | 74.83                   | 74.83                    |
| 5            | 634.90                             | 6.80                               | 0.0                                 | 2158.01                             | 1.75                               | 1.75                                | 22530.88                | 241.57                  | 0.0                      | 76609.13                 | 61.95                   | 61.95                    |
| 6            | 1027.93                            | 13.05                              | 0.0                                 | 1523.34                             | 3.45                               | 3.45                                | 111838.81               | 1419.35                 | 0.0                      | 165739.56                | 375.75                  | 375.75                   |
| 7            | 610.62                             | 7.19                               | 0.0                                 | 2163.68                             | 4.21                               | 4.21                                | 63692.52                | 725.84                  | 0.0                      | 218531.81                | 424.88                  | 424.88                   |
| 8            | 643.49                             | 7.19                               | 0.0                                 | 2143.46                             | 3.57                               | 3.57                                | 36936.26                | 412.51                  | 0.0                      | 123034.56                | 205.06                  | 205.06                   |
| 8            | 1279.11                            | 20.28                              | 0.0                                 | 1108.84                             | 0.38                               | 0.38                                | 63443.88                | 1005.81                 | 0.0                      | 54998.41                 | 18.87                   | 18.87                    |
| 9            | 744.28                             | 8.29                               | 0.0                                 | 1982.08                             | 2.57                               | 2.57                                | 33343.63                | 371.25                  | 0.0                      | 88797.19                 | 115.11                  | 115.11                   |
| 10           | 816.17                             | 13.61                              | 0.0                                 | 1854.53                             | 0.66                               | 0.66                                | 10120.51                | 168.72                  | 0.0                      | 22996.14                 | 8.18                    | 8.18                     |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.00                          | 3.00                 | 873.37                 | 13100.56             | 2.620                  | 16.87                  | 253.12               | 0.051                  | 1.01                   | 15.19                | 0.0030                 |
| 6                       | 0.30                    | 108.80                         | 0.54                 | 1027.93                | 111838.81            | 0.559                  | 13.05                  | 1419.35              | 0.007                  | 3.45                   | 375.75               | 0.0019                 |
| 7                       | 5.00                    | 101.00                         | 8.38                 | 630.62                 | 63692.52             | 5.286                  | 7.19                   | 725.84               | 0.060                  | 4.21                   | 424.88               | 0.0353                 |
| 9                       | 6.00                    | 44.80                          | 4.48                 | 744.28                 | 33343.63             | 3.334                  | 8.29                   | 371.25               | 0.037                  | 2.57                   | 115.11               | 0.0115                 |
| 10                      | 4.00                    | 12.40                          | 0.83                 | 816.17                 | 10120.51             | 0.678                  | 13.61                  | 168.72               | 0.011                  | 0.66                   | 8.18                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 17.238               |                        |                      | 12.478                 |                        |                      | 0.166                  |                        |                      | 0.0522                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.724                  |                        |                      | 0.010                  |                        |                      | 0.0030                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 390 ENGINE TYPE AND MODEL: O-470-R SERIAL NUMBER: 133510-6-R  
 RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: 69. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 74.50

ATMOSPHERIC PRESSURE: START 30.12 FINISH 30.12

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 47.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 14.10                          | 90.00                         | 0.09221           |
| IDLE/TAXI   |                 | 2            | -0.0          | 16.70                          | 168.00                        | 0.08839           |
| RUN UP      |                 | 3            | -0.0          | 30.90                          | 388.00                        | 0.07375           |
| RUN UP-LEAN |                 | 4            | -0.0          | 30.00                          | 403.00                        | 0.07101           |
| RUN UP-RICH |                 | 5            | -0.0          | 30.00                          | 397.00                        | 0.07212           |
| TAKE-OFF    |                 | 6            | -0.0          | 97.70                          | 1131.00                       | 0.08409           |
| CLIMB       |                 | 7            | -0.0          | 71.30                          | 937.00                        | 0.07525           |
| DESCENT     |                 | 8            | -0.0          | 62.30                          | 802.00                        | 0.07498           |
| DESCENT     |                 | 9            | -0.0          | 66.30                          | 696.00                        | 0.08864           |
| APPROACH    |                 | 9            | -0.0          | 42.00                          | 517.00                        | 0.07687           |
| TAXI        |                 | 10           | -0.0          | 15.80                          | 156.00                        | 0.09050           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 628.00                              | -0.00                              | 8.40                     | 3.90                          | 72414.00             | 3.00                | -0.00                    | -0.00                    | 36.00              | -0.00 | -0.00        |
| 2            | 930.00                              | -0.00                              | 10.30                    | 7.20                          | 14971.00             | 8.00                | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |
| 3            | 1256.00                             | -0.00                              | 6.00                     | 9.90                          | 1682.00              | 167.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1390.00                             | -0.00                              | 4.10                     | 11.40                         | 868.00               | 100.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1356.00                             | -0.00                              | 4.50                     | 11.20                         | 1139.00              | 95.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1536.00                             | -0.00                              | 9.00                     | 9.00                          | 2278.00              | 38.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1558.00                             | -0.00                              | 4.90                     | 11.50                         | 1193.00              | 114.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1513.00                             | -0.00                              | 5.50                     | 10.90                         | 124.80               | 89.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1323.00                             | -0.00                              | 11.70                    | 7.10                          | 2332.00              | 17.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1323.00                             | -0.00                              | 6.80                     | 9.80                          | 1356.00              | 266.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 964.00                              | -0.00                              | 10.90                    | 7.00                          | 15296.00             | 6.00                | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 868.41                             | 428.76                             | 0.0                                 | 633.50                              | 0.05                               | 0.05                                | 12244.59                | 6045.51                 | 0.0                      | 8932.40                  | 0.72                    | 0.72                     |
| 2            | 1095.35                            | 91.18                              | 0.0                                 | 1203.05                             | 0.14                               | 0.14                                | 18292.30                | 1522.74                 | 0.0                      | 20091.00                 | 2.33                    | 2.33                     |
| 3            | 754.37                             | 12.11                              | 0.0                                 | 1955.73                             | 3.45                               | 3.45                                | 23310.10                | 374.25                  | 0.0                      | 60431.95                 | 106.57                  | 106.57                   |
| 4            | 531.41                             | 6.44                               | 0.0                                 | 2321.60                             | 2.13                               | 2.13                                | 15942.26                | 193.30                  | 0.0                      | 69648.06                 | 63.87                   | 63.87                    |
| 5            | 574.88                             | 8.33                               | 0.0                                 | 2248.12                             | 1.99                               | 1.99                                | 17246.30                | 250.01                  | 0.0                      | 67443.50                 | 59.80                   | 59.80                    |
| 6            | 997.49                             | 14.46                              | 0.0                                 | 1567.29                             | 0.69                               | 0.69                                | 97455.06                | 1412.74                 | 0.0                      | 153123.69                | 67.59                   | 67.59                    |
| 7            | 599.25                             | 8.36                               | 0.0                                 | 2209.77                             | 2.29                               | 2.29                                | 42726.32                | 595.78                  | 0.0                      | 157556.25                | 163.28                  | 163.28                   |
| 8            | 677.00                             | 0.88                               | 0.0                                 | 2108.11                             | 1.80                               | 1.80                                | 42177.25                | 54.81                   | 0.0                      | 131334.94                | 112.11                  | 112.11                   |
| 8            | 1241.87                            | 14.18                              | 0.0                                 | 1184.10                             | 0.30                               | 0.30                                | 82335.94                | 939.89                  | 0.0                      | 78505.50                 | 19.65                   | 19.65                    |
| 9            | 820.86                             | 9.37                               | 0.0                                 | 1858.77                             | 5.27                               | 5.27                                | 34476.13                | 393.74                  | 0.0                      | 78068.19                 | 221.52                  | 221.52                   |
| 10           | 1133.35                            | 91.09                              | 0.0                                 | 1143.60                             | 0.10                               | 0.10                                | 17906.95                | 1439.19                 | 0.0                      | 18068.88                 | 1.62                    | 1.62                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 16.70                          | 3.34                 | 1095.35                | 18292.30             | 3.658                  | 91.18                  | 1522.74              | 0.305                  | 0.14                   | 2.33                 | 0.0005                 |
| 6                       | 0.30                    | 97.70                          | 0.49                 | 997.49                 | 97455.06             | 0.487                  | 14.46                  | 1412.74              | 0.007                  | 0.69                   | 67.59                | 0.0003                 |
| 7                       | 5.00                    | 71.30                          | 5.92                 | 599.25                 | 42726.32             | 3.546                  | 8.36                   | 595.78               | 0.049                  | 2.29                   | 163.28               | 0.0136                 |
| 9                       | 6.00                    | 42.00                          | 4.20                 | 820.86                 | 34476.13             | 3.448                  | 9.37                   | 393.74               | 0.039                  | 5.27                   | 221.52               | 0.0222                 |
| 10                      | 4.00                    | 15.80                          | 1.06                 | 1133.35                | 17906.95             | 1.200                  | 91.09                  | 1439.19              | 0.096                  | 0.10                   | 1.62                 | 0.0001                 |
| TOTAL FOR CYCLE         |                         |                                | 15.005               |                        |                      | 12.339                 |                        |                      | 0.497                  |                        |                      | 0.0366                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.822                  |                        |                      | 0.033                  |                        |                      | 0.0024                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 366 ENGINE TYPE AND MODEL: TS10-520-E

SERIAL NUMBER: 206193-9-E

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 214. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 89.50

ATMOSPHERIC PRESSURE: START 30.20 FINISH 30.20

INLET AIR HUMIDITY, GWN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 53.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 96.70                          | 1044.00                       | 0.08043           |
| IDLE/TAXI   |                 | 2            | -0.0          | 35.20                          | 466.00                        | 0.07672           |
| RUN UP      |                 | 3            | -0.0          | 49.20                          | 635.00                        | 0.07881           |
| RUN UP-LEAN |                 | 4            | -0.0          | 43.90                          | 585.00                        | 0.07794           |
| RUN UP-RICH |                 | 5            | -0.0          | 24.60                          | 324.00                        | 0.07888           |
| TAKE-OFF    |                 | 6            | -0.0          | 105.50                         | 1504.00                       | 0.07393           |
| CLIMB       |                 | 7            | -0.0          | 84.40                          | 1142.00                       | 0.07758           |
| DESCENT     |                 | 8            | -0.0          | 77.40                          | 997.00                        | 0.08081           |
| APPROACH    |                 | 9            | -0.0          | 58.00                          | 697.00                        | 0.08007           |
| TAXI        |                 | 10           | -0.0          | 40.40                          | 483.00                        | 0.08212           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYOES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 504.00                              | -0.00                              | 4.60                     | 9.80                          | 31258.00             | 17.00               | -0.00                    | -0.00                    | 40.00              | -0.00 | -0.00        |
| 2            | 594.00                              | -0.00                              | 4.40                     | 12.00                         | 4821.00              | 44.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |
| 3            | 642.00                              | -0.00                              | 5.70                     | 11.60                         | 21.46                | 246.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 908.00                              | -0.00                              | 4.70                     | 12.30                         | 1700.00              | 150.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 964.00                              | -0.00                              | 5.10                     | 12.10                         | 1588.00              | 160.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 2.20                     | 14.10                         | 1310.00              | 1904.00             | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1312.00                             | -0.00                              | 4.20                     | 12.80                         | 1310.00              | 812.00              | -0.00                    | -0.00                    | 20.00              | -0.00 | -0.00        |
| 8            | 1244.00                             | -0.00                              | 5.90                     | 11.70                         | 1477.00              | 261.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1110.00                             | -0.00                              | 7.70                     | 9.50                          | 2034.00              | 155.00              | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |
| 10           | 886.00                              | -0.00                              | 7.60                     | 9.50                          | 7496.00              | 48.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 530.25                             | 206.36                             | 0.0                                 | 1774.96                             | 0.32                               | 0.32                                | 51275.28                | 19955.23                | 0.0                      | 171638.38                | 31.13                   | 31.13                    |
| 2            | 526.54                             | 33.04                              | 0.0                                 | 2256.29                             | 0.86                               | 0.86                                | 18534.05                | 1163.06                 | 0.0                      | 79421.38                 | 30.44                   | 30.44                    |
| 3            | 665.54                             | 0.14                               | 0.0                                 | 2128.13                             | 4.72                               | 4.72                                | 32744.73                | 7.06                    | 0.0                      | 104703.94                | 232.13                  | 232.13                   |
| 4            | 553.01                             | 11.46                              | 0.0                                 | 2273.92                             | 2.90                               | 2.90                                | 24276.91                | 502.91                  | 0.0                      | 99825.00                 | 127.26                  | 127.26                   |
| 5            | 593.54                             | 10.58                              | 0.0                                 | 2212.61                             | 3.06                               | 3.06                                | 14601.15                | 260.38                  | 0.0                      | 54430.28                 | 75.24                   | 75.24                    |
| 6            | 270.50                             | 9.22                               | 0.0                                 | 2723.93                             | 38.45                              | 38.45                               | 28537.27                | 973.21                  | 0.0                      | 287374.00                | 4056.74                 | 4056.74                  |
| 7            | 495.30                             | 8.85                               | 0.0                                 | 2371.74                             | 15.73                              | 15.73                               | 41803.28                | 746.75                  | 0.0                      | 200174.88                | 1327.51                 | 1327.51                  |
| 8            | 671.60                             | 9.63                               | 0.0                                 | 2092.59                             | 4.88                               | 4.88                                | 51981.93                | 745.29                  | 0.0                      | 161966.31                | 377.71                  | 377.71                   |
| 9            | 893.84                             | 13.52                              | 0.0                                 | 1732.73                             | 2.96                               | 2.96                                | 51842.56                | 784.32                  | 0.0                      | 100498.06                | 171.41                  | 171.41                   |
| 10           | 860.18                             | 48.59                              | 0.0                                 | 1689.41                             | 0.89                               | 0.89                                | 34751.08                | 1963.04                 | 0.0                      | 68252.13                 | 36.05                   | 36.05                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 35.20                          | 7.04                 | 526.54                 | 18534.05             | 3.707                  | 33.04                  | 1163.06              | 0.233                  | 0.86                   | 30.44                | 0.0061                 |
| 6                       | 0.30                    | 105.50                         | 0.53                 | 270.50                 | 28537.27             | 0.143                  | 9.22                   | 973.21               | 0.005                  | 38.45                  | 4056.74              | 0.0203                 |
| 7                       | 5.00                    | 84.40                          | 7.01                 | 495.30                 | 41803.28             | 3.470                  | 8.85                   | 746.75               | 0.062                  | 15.73                  | 1327.51              | 0.1102                 |
| 9                       | 6.00                    | 58.00                          | 5.80                 | 893.84                 | 51842.56             | 5.184                  | 13.52                  | 784.32               | 0.078                  | 2.96                   | 171.41               | 0.0171                 |
| 10                      | 4.00                    | 40.40                          | 2.71                 | 860.18                 | 34751.08             | 2.328                  | 48.59                  | 1963.04              | 0.132                  | 0.89                   | 36.05                | 0.0024                 |
| TOTAL FOR CYCLE         |                         |                                | 23.079               |                        |                      | 14.832                 |                        |                      | 0.509                  |                        |                      | 0.1561                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.643                  |                        |                      | 0.022                  |                        |                      | 0.0068                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 367 ENGINE TYPE AND MODEL: TS10-520-E SERIAL NUMBER: 206193-9-EA

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 214. MRS

FUEL: AV GAS 100/130 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.50 FINISH 77.50

ATMOSPHERIC PRESSURE: START 30.16 FINISH 30.16

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.07122           |
| IDLE/TAXI   |                 | 2            | -0.0          | 33.40                          | 431.00                        | 0.07196           |
| RUN UP      |                 | 3            | -0.0          | 51.00                          | 631.00                        | 0.07635           |
| RUN UP-LEAN |                 | 4            | -0.0          | 45.70                          | 579.00                        | 0.07413           |
| RUN UP-RICH |                 | 5            | -0.0          | 28.10                          | 353.00                        | 0.07420           |
| TAKE-OFF    |                 | 6            | -0.0          | 126.60                         | 1706.00                       | 0.07032           |
| CLIMB       |                 | 7            | -0.0          | 98.40                          | 1253.00                       | 0.07397           |
| DESCENT     |                 | 8            | -0.0          | 87.90                          | 1080.00                       | 0.07528           |
| APPROACH    |                 | 9            | -0.0          | 58.00                          | 695.00                        | 0.07746           |
| TAXI        |                 | 10           | -0.0          | 36.90                          | 443.00                        | 0.07720           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 605.00                              | -0.00                              | 4.50                     | 8.40                          | 25238.00             | 13.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 2            | 673.00                              | -0.00                              | 4.60                     | 10.40                         | 7211.00              | 47.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 3            | 953.00                              | -0.00                              | 6.60                     | 9.80                          | 2240.00              | 200.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 930.00                              | -0.00                              | 5.80                     | 10.20                         | 1748.00              | 127.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 998.00                              | -0.00                              | 6.00                     | 10.00                         | 1748.00              | 127.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 3.80                     | 11.50                         | 1420.00              | 999.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 5.70                     | 10.30                         | 1475.00              | 219.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 6.70                     | 9.50                          | 1693.00              | 169.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 7.50                     | 9.10                          | 2076.00              | 144.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 7.00                     | 9.10                          | 6555.00              | 52.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 589.42                             | 189.33                             | 0.0                                 | 1728.73                             | 0.28                               | 0.28                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 2            | 591.12                             | 53.07                              | 0.0                                 | 2099.86                             | 0.99                               | 0.99                                | 19743.44                | 1772.58                 | 0.0                      | 70135.31                 | 33.13                   | 33.13                    |
| 3            | 802.07                             | 15.59                              | 0.0                                 | 1871.25                             | 3.99                               | 3.99                                | 40905.38                | 795.11                  | 0.0                      | 95433.50                 | 203.60                  | 203.60                   |
| 4            | 724.42                             | 12.50                              | 0.0                                 | 2001.71                             | 2.61                               | 2.61                                | 33106.02                | 571.43                  | 0.0                      | 91478.19                 | 119.07                  | 119.07                   |
| 5            | 749.40                             | 12.50                              | 0.0                                 | 1962.46                             | 2.61                               | 2.61                                | 21058.15                | 351.36                  | 0.0                      | 55145.17                 | 73.21                   | 73.21                    |
| 6            | 497.14                             | 10.64                              | 0.0                                 | 2363.93                             | 21.47                              | 21.47                               | 62938.32                | 1346.99                 | 0.0                      | 299273.19                | 2717.80                 | 2717.80                  |
| 7            | 713.13                             | 10.57                              | 0.0                                 | 2024.75                             | 4.50                               | 4.50                                | 70172.31                | 1039.99                 | 0.0                      | 199235.50                | 442.85                  | 442.85                   |
| 8            | 826.89                             | 11.97                              | 0.0                                 | 1842.19                             | 3.43                               | 3.43                                | 72683.38                | 1051.87                 | 0.0                      | 161928.19                | 301.14                  | 301.14                   |
| 9            | 901.48                             | 14.29                              | 0.0                                 | 1718.60                             | 2.84                               | 2.84                                | 52285.99                | 828.89                  | 0.0                      | 99679.00                 | 164.89                  | 164.89                   |
| 10           | 844.00                             | 45.26                              | 0.0                                 | 1723.95                             | 1.03                               | 1.03                                | 31143.60                | 1670.28                 | 0.0                      | 63613.68                 | 38.00                   | 38.00                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 33.40                          | 6.68                 | 591.12                 | 19743.44             | 3.949                  | 53.07                  | 1772.58              | 0.355                  | 0.99                   | 33.13                | 0.0066                 |
| 6                       | 0.30                    | 126.60                         | 0.63                 | 497.14                 | 62938.32             | 0.315                  | 10.64                  | 1346.99              | 0.007                  | 21.47                  | 2717.80              | 0.0136                 |
| 7                       | 5.00                    | 98.40                          | 8.17                 | 713.13                 | 70172.31             | 5.824                  | 10.57                  | 1039.99              | 0.086                  | 4.50                   | 442.85               | 0.0368                 |
| 9                       | 6.00                    | 58.00                          | 5.80                 | 901.48                 | 52285.99             | 5.229                  | 14.29                  | 828.89               | 0.083                  | 2.84                   | 164.89               | 0.0165                 |
| 10                      | 4.00                    | 36.90                          | 2.47                 | 844.00                 | 31143.60             | 2.087                  | 45.26                  | 1670.28              | 0.112                  | 1.03                   | 38.00                | 0.0025                 |
| TOTAL FOR CYCLE         |                         |                                | 23.752               |                        |                      | 17.403                 |                        |                      | 0.642                  |                        |                      | 0.0760                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.733                  |                        |                      | 0.027                  |                        |                      | 0.0032                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 368 ENGINE TYPE AND MODEL: TS10-520-E SERIAL NUMBER: 206193-9-E

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 214. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 77.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.08215           |
| IDLE/TAXI   |                 | 2            | -0.0          | 33.40                          | 415.00                        | 0.07995           |
| RUN UP      |                 | 3            | -0.0          | 52.70                          | 619.00                        | 0.08007           |
| RUN UP-LEAN |                 | 4            | -0.0          | 49.20                          | 593.00                        | 0.07877           |
| RUN UP-RICH |                 | 5            | -0.0          | 29.90                          | 381.00                        | 0.07539           |
| TAKE-OFF    |                 | 6            | -0.0          | 110.80                         | 1564.00                       | 0.06939           |
| CLIMB       |                 | 7            | -0.0          | 102.00                         | 1330.00                       | 0.07371           |
| DESCENT     |                 | 8            | -0.0          | 93.20                          | 1176.00                       | 0.07675           |
| APPROACH    |                 | 9            | -0.0          | 59.80                          | 725.00                        | 0.07864           |
| TAXI        |                 | 10           | -0.0          | 38.70                          | 472.00                        | 0.07920           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 404.00                              | -0.00                              | 5.10                     | 9.10                          | 36416.00             | 16.00               | -0.00                    | -0.00                    | 32.00              | -0.00 | -0.00        |
| 2            | 583.00                              | -0.00                              | 6.20                     | 10.30                         | 9490.00              | 39.00               | -0.00                    | -0.00                    | 26.00              | -0.00 | -0.00        |
| 3            | 942.00                              | -0.00                              | 8.20                     | 8.90                          | 2538.00              | 238.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 897.00                              | -0.00                              | 7.50                     | 9.40                          | 2152.00              | 82.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 986.00                              | -0.00                              | 5.80                     | 10.50                         | 1710.00              | 128.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1256.00                             | -0.00                              | 2.40                     | 12.80                         | 1324.00              | 1842.00             | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1244.00                             | -0.00                              | 5.00                     | 11.00                         | 1435.00              | 543.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 6.10                     | 10.40                         | 1490.00              | 334.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 7.30                     | 9.60                          | 2042.00              | 187.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 10           | 852.00                              | -0.00                              | 7.00                     | 9.80                          | 4414.00              | 72.00               | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 577.48                             | 236.16                             | 0.0                                 | 1619.00                             | 0.30                               | 0.30                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 2            | 717.83                             | 62.93                              | 0.0                                 | 1873.73                             | 0.74                               | 0.74                                | 23975.59                | 2101.79                 | 0.0                      | 62582.52                 | 24.77                   | 24.77                    |
| 3            | 954.60                             | 16.92                              | 0.0                                 | 1627.93                             | 4.55                               | 4.55                                | 50307.37                | 891.77                  | 0.0                      | 85791.81                 | 239.84                  | 239.84                   |
| 4            | 885.28                             | 14.55                              | 0.0                                 | 1743.36                             | 1.59                               | 1.59                                | 43555.82                | 715.77                  | 0.0                      | 85773.00                 | 78.22                   | 78.22                    |
| 5            | 711.39                             | 12.01                              | 0.0                                 | 2023.53                             | 2.58                               | 2.58                                | 21270.66                | 359.17                  | 0.0                      | 60503.49                 | 77.11                   | 77.11                    |
| 6            | 316.23                             | 9.99                               | 0.0                                 | 2649.96                             | 39.87                              | 39.87                               | 35038.24                | 1107.04                 | 0.0                      | 293615.69                | 4417.14                 | 4417.14                  |
| 7            | 625.71                             | 10.28                              | 0.0                                 | 2162.89                             | 11.16                              | 11.16                               | 63822.55                | 1049.06                 | 0.0                      | 220615.06                | 1138.48                 | 1138.48                  |
| 8            | 740.19                             | 10.35                              | 0.0                                 | 1982.83                             | 6.66                               | 6.66                                | 68985.69                | 965.07                  | 0.0                      | 184799.56                | 620.43                  | 620.43                   |
| 9            | 862.23                             | 13.81                              | 0.0                                 | 1781.59                             | 3.63                               | 3.63                                | 51561.20                | 826.04                  | 0.0                      | 106539.19                | 216.95                  | 216.95                   |
| 10           | 820.21                             | 29.62                              | 0.0                                 | 1804.24                             | 1.39                               | 1.39                                | 31742.28                | 1146.35                 | 0.0                      | 69823.94                 | 53.63                   | 53.63                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 33.40                          | 6.68                 | 717.83                 | 23975.59             | 4.795                  | 62.93                  | 2101.79              | 0.420                  | 0.74                   | 24.77                | 0.0050                 |
| 6                       | 0.30            | 110.80                         | 0.55                 | 316.23                 | 35038.24             | 0.175                  | 9.99                   | 1107.04              | 0.006                  | 39.87                  | 4417.14              | 0.0221                 |
| 7                       | 5.00            | 102.00                         | 8.47                 | 625.71                 | 63822.55             | 5.297                  | 10.28                  | 1049.06              | 0.087                  | 11.16                  | 1138.48              | 0.0945                 |
| 9                       | 6.00            | 59.80                          | 5.98                 | 862.23                 | 51561.20             | 5.156                  | 13.81                  | 826.04               | 0.083                  | 3.63                   | 216.95               | 0.0217                 |
| 10                      | 4.00            | 38.70                          | 2.59                 | 820.21                 | 31742.28             | 2.127                  | 29.62                  | 1146.35              | 0.077                  | 1.39                   | 53.63                | 0.0036                 |
| TOTAL FOR CYCLE         |                 |                                | 24.273               |                        |                      | 17.550                 |                        |                      | 0.672                  |                        |                      | 0.1468                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 0.723                  |                        |                      | 0.028                  |                        |                      | 0.0060                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 369 ENGINE TYPE AND MODEL: TS10-520-E SERIAL NUMBER: 206211-9-E

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 214. MRS

FUEL: AV GAS 100/130 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.50 FINISH 75.50

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.09374           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.90                          | 223.00                        | 0.09162           |
| RUN UP      |                 | 3            | -0.0          | 45.70                          | 497.00                        | 0.08394           |
| RUN UP-LEAN |                 | 4            | -0.0          | 45.70                          | 509.00                        | 0.08219           |
| RUN UP-RICH |                 | 5            | -0.0          | 43.90                          | 488.00                        | 0.08264           |
| TAKE-OFF    |                 | 6            | -0.0          | 130.10                         | 1703.00                       | 0.07293           |
| CLIMB       |                 | 7            | -0.0          | 116.00                         | 1344.00                       | 0.07950           |
| DESCENT     |                 | 8            | -0.0          | 107.20                         | 1235.00                       | 0.08000           |
| APPROACH    |                 | 9            | -0.0          | 59.80                          | 640.00                        | 0.08414           |
| TAXI        |                 | 10           | -0.0          | 19.30                          | 200.00                        | 0.08524           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 471.00                              | -0.00                              | 6.60                     | 7.80                          | 58304.00             | 15.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 8.90                     | 7.90                          | 29646.00             | 22.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 3            | 930.00                              | -0.00                              | 10.30                    | 7.40                          | 3568.00              | 54.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 908.00                              | -0.00                              | 9.60                     | 7.80                          | 3184.00              | 47.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 964.00                              | -0.00                              | 9.70                     | 7.80                          | 3129.00              | 48.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1289.00                             | -0.00                              | 4.80                     | 11.00                         | 1757.00              | 716.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1267.00                             | -0.00                              | 4.50                     | 8.50                          | 1976.00              | 145.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1267.00                             | -0.00                              | 8.70                     | 8.40                          | 1976.00              | 135.00              | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 10.70                    | 7.10                          | 2745.00              | 54.00               | -0.00                    | -0.00                    | 55.00              | -0.00 | -0.00        |
| 10           | 841.00                              | -0.00                              | 8.90                     | 7.80                          | 16799.00             | 34.00               | -0.00                    | -0.00                    | 46.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 659.08                             | 333.46                             | 0.0                                 | 1223.86                             | 0.25                               | 0.25                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 2            | 909.71                             | 173.55                             | 0.0                                 | 1268.76                             | 0.37                               | 0.37                                | 20832.38                | 3974.30                 | 0.0                      | 29054.56                 | 8.46                    | 8.46                     |
| 3            | 1152.39                            | 22.86                              | 0.0                                 | 1300.86                             | 0.99                               | 0.99                                | 52664.07                | 1044.83                 | 0.0                      | 59449.36                 | 45.35                   | 45.35                    |
| 4            | 1094.58                            | 20.79                              | 0.0                                 | 1397.37                             | 0.88                               | 0.88                                | 50022.43                | 950.19                  | 0.0                      | 63859.60                 | 40.23                   | 40.23                    |
| 5            | 1100.12                            | 20.32                              | 0.0                                 | 1389.95                             | 0.89                               | 0.89                                | 48295.13                | 892.24                  | 0.0                      | 61018.92                 | 39.25                   | 39.25                    |
| 6            | 606.99                             | 12.73                              | 0.0                                 | 2185.61                             | 14.87                              | 14.87                               | 78969.63                | 1655.53                 | 0.0                      | 284347.88                | 1934.87                 | 1934.87                  |
| 7            | 998.51                             | 13.29                              | 0.0                                 | 1568.89                             | 2.80                               | 2.80                                | 115827.25               | 1542.14                 | 0.0                      | 181990.69                | 324.55                  | 324.55                   |
| 8            | 1016.10                            | 13.22                              | 0.0                                 | 1541.46                             | 2.59                               | 2.59                                | 108925.56               | 1416.91                 | 0.0                      | 165244.88                | 277.63                  | 277.63                   |
| 9            | 1195.97                            | 17.57                              | 0.0                                 | 1246.90                             | 0.99                               | 0.99                                | 71518.81                | 1050.81                 | 0.0                      | 74564.63                 | 59.29                   | 59.29                    |
| 10           | 978.25                             | 105.75                             | 0.0                                 | 1347.07                             | 0.61                               | 0.61                                | 18880.16                | 2041.01                 | 0.0                      | 25998.50                 | 11.85                   | 11.85                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 22.90                          | 4.58                 | 909.71                 | 20832.38             | 4.166                  | 173.55                 | 3974.30              | 0.795                  | 0.37                   | 8.46                 | 0.0017                 |
| 6                       | 0.30                    | 130.10                         | 0.65                 | 606.99                 | 78969.63             | 0.395                  | 12.73                  | 1655.53              | 0.008                  | 14.87                  | 1934.87              | 0.0097                 |
| 7                       | 5.00                    | 116.00                         | 9.63                 | 998.51                 | 115827.25            | 9.614                  | 13.29                  | 1542.14              | 0.128                  | 2.80                   | 324.55               | 0.0269                 |
| 9                       | 6.00                    | 59.80                          | 5.98                 | 1195.97                | 71518.81             | 7.152                  | 17.57                  | 1050.81              | 0.105                  | 0.99                   | 59.29                | 0.0059                 |
| 10                      | 4.00                    | 19.30                          | 1.29                 | 978.25                 | 18880.16             | 1.265                  | 105.75                 | 2041.01              | 0.137                  | 0.61                   | 11.85                | 0.0008                 |
| TOTAL FOR CYCLE         |                         |                                | 22.132               |                        |                      | 22.592                 |                        |                      | 1.173                  |                        |                      | 0.0450                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.021                  |                        |                      | 0.053                  |                        |                      | 0.0020                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 370 ENGINE TYPE AND MODEL: TS10-520-E

SERIAL NUMBER: 206211-9-EA

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 214. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.09587           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.30                          | 181.00                        | 0.28822           |
| RUN UP      |                 | 3            | -0.0          | 47.50                          | 514.00                        | 0.08137           |
| RUN UP-LEAN |                 | 4            | -0.0          | 45.70                          | 508.00                        | 0.07919           |
| RUN UP-RICH |                 | 5            | -0.0          | 45.70                          | 503.00                        | 0.07964           |
| TAKE-OFF    |                 | 6            | -0.0          | 128.30                         | 1696.00                       | 0.06984           |
| CLIMB       |                 | 7            | -0.0          | 114.30                         | 1368.00                       | 0.07518           |
| DESCENT     |                 | 8            | -0.0          | 105.50                         | 1231.00                       | 0.07672           |
| APPROACH    |                 | 9            | -0.0          | 58.00                          | 619.00                        | 0.08103           |
| TAXI        |                 | 10           | -0.0          | 19.30                          | 201.00                        | 0.08136           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 448.00                              | -0.00                              | 6.80                     | 5.80                          | 79056.00             | 9.00                | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 2            | 583.00                              | -0.00                              | 9.90                     | 66.60                         | 29317.00             | 19.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 3            | 919.00                              | -0.00                              | 10.00                    | 7.10                          | 3843.00              | 52.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 897.00                              | -0.00                              | 9.20                     | 7.50                          | 3514.00              | 47.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 964.00                              | -0.00                              | 9.50                     | 7.30                          | 3294.00              | 47.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1267.00                             | -0.00                              | 4.30                     | 10.80                         | 1867.00              | 789.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1278.00                             | -0.00                              | 7.30                     | 8.80                          | 1921.00              | 207.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1278.00                             | -0.00                              | 8.00                     | 8.40                          | 1921.00              | 148.00              | -0.00                    | -0.00                    | 17.00              | -0.00 | -0.00        |
| 9            | 1087.00                             | -0.00                              | 10.30                    | 6.80                          | 2855.00              | 49.00               | -0.00                    | -0.00                    | 53.00              | -0.00 | -0.00        |
| 10           | 863.00                              | -0.00                              | 8.60                     | 7.40                          | 15152.00             | 37.00               | -0.00                    | -0.00                    | 62.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 669.94                             | 446.08                             | 0.0                                 | 897.83                              | 0.15                               | 0.15                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 2            | 229.25                             | 43.25                              | 0.0                                 | 2695.40                             | 0.08                               | 0.08                                | 4424.43                 | 834.70                  | 0.0                      | 52021.16                 | 1.55                    | 1.55                     |
| 3            | 1155.46                            | 25.43                              | 0.0                                 | 1288.99                             | 0.99                               | 0.99                                | 54884.18                | 1207.99                 | 0.0                      | 61227.08                 | 46.88                   | 46.88                    |
| 4            | 1090.01                            | 23.84                              | 0.0                                 | 1376.18                             | 0.91                               | 0.91                                | 49813.35                | 1089.69                 | 0.0                      | 63805.40                 | 41.80                   | 41.80                    |
| 5            | 1170.43                            | 22.25                              | 0.0                                 | 1352.76                             | 0.91                               | 0.91                                | 51203.47                | 1016.82                 | 0.0                      | 61821.13                 | 41.61                   | 41.61                    |
| 6            | 568.27                             | 14.13                              | 0.0                                 | 2242.59                             | 17.13                              | 17.13                               | 72909.25                | 1813.03                 | 0.0                      | 287724.31                | 2197.41                 | 2197.41                  |
| 7            | 905.21                             | 13.64                              | 0.0                                 | 1714.53                             | 4.22                               | 4.22                                | 103465.00               | 1559.35                 | 0.0                      | 195971.00                | 481.91                  | 481.91                   |
| 8            | 974.07                             | 13.40                              | 0.0                                 | 1607.01                             | 2.96                               | 2.96                                | 102764.44               | 1413.27                 | 0.0                      | 169539.25                | 312.27                  | 312.27                   |
| 9            | 1196.88                            | 19.00                              | 0.0                                 | 1241.54                             | 0.94                               | 0.94                                | 69419.25                | 1102.03                 | 0.0                      | 72009.44                 | 54.24                   | 54.24                    |
| 10           | 991.94                             | 100.09                             | 0.0                                 | 1341.09                             | 0.70                               | 0.70                                | 19144.41                | 1931.79                 | 0.0                      | 25882.93                 | 13.53                   | 13.53                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.30                          | 3.86                 | 229.25                 | 4424.43              | 0.885                  | 43.25                  | 834.70               | 0.167                  | 0.08                   | 1.55                 | 0.0003                 |
| 6                       | 0.30                    | 128.30                         | 0.64                 | 568.27                 | 72909.25             | 0.365                  | 14.13                  | 1813.03              | 0.009                  | 17.13                  | 2197.41              | 0.0110                 |
| 7                       | 5.00                    | 114.30                         | 9.49                 | 405.21                 | 103465.00            | 8.588                  | 13.64                  | 1559.35              | 0.129                  | 4.22                   | 481.91               | 0.0400                 |
| 9                       | 6.00                    | 58.00                          | 5.80                 | 1196.88                | 69419.25             | 6.942                  | 19.00                  | 1102.03              | 0.110                  | 0.94                   | 54.24                | 0.0054                 |
| 10                      | 4.00                    | 19.30                          | 1.29                 | 991.94                 | 19144.41             | 1.283                  | 100.09                 | 1931.79              | 0.129                  | 0.70                   | 13.53                | 0.0009                 |
| TOTAL FOR CYCLE         |                         |                                | 21.081               |                        |                      | 18.062                 |                        |                      | 0.545                  |                        |                      | 0.0576                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.857                  |                        |                      | 0.076                  |                        |                      | 0.0027                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 371 ENGINE TYPE AND MODEL: TS10-520-E SERIAL NUMBER: 206211-9-EB

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 214. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 73.00 FINISH 73.00

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 8.20 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.07262           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.90                          | 256.00                        | 0.07531           |
| RUN UP      |                 | 3            | -0.0          | 47.50                          | 529.00                        | 0.08396           |
| RUN UP-LEAN |                 | 4            | -0.0          | 45.70                          | 519.00                        | 0.08140           |
| RUN UP-RICH |                 | 5            | -0.0          | 43.90                          | 495.00                        | 0.08232           |
| TAKE-OFF    |                 | 6            | -0.0          | 128.30                         | 1720.00                       | 0.07178           |
| CLIMB       |                 | 7            | -0.0          | 114.30                         | 1367.00                       | 0.07865           |
| DESCENT     |                 | 8            | -0.0          | 105.50                         | 1233.00                       | 0.08024           |
| APPROACH    |                 | 9            | -0.0          | 56.30                          | 598.00                        | 0.08608           |
| TAXI        |                 | 10           | -0.0          | 21.10                          | 218.00                        | 0.08592           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(ORY)<br>PERCENT V | CO<br>2<br>(ORY)<br>PERCENT V | THC<br>(ORY)<br>PPHV | NO<br>(ORY)<br>PPHV | NO<br>2<br>(ORY)<br>PPHV | NO<br>X<br>(ORY)<br>PPHV | ALDEHYDES<br>(ORY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 448.00                              | -0.00                              | 4.50                     | 8.70                          | 25483.00             | 18.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 5.20                     | 9.10                          | 20567.00             | 32.00               | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 3            | 930.00                              | -0.00                              | 9.80                     | 8.00                          | 3141.00              | 71.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 919.00                              | -0.00                              | 9.10                     | 8.20                          | 2813.00              | 58.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 964.00                              | -0.00                              | 9.40                     | 8.10                          | 2704.00              | 57.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1334.00                             | -0.00                              | 4.10                     | 11.50                         | 1611.00              | 1058.00             | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1300.00                             | -0.00                              | 7.70                     | 9.20                          | 1721.00              | 207.00              | -0.00                    | -0.00                    | 25.00              | -0.00 | -0.00        |
| 8            | 1278.00                             | -0.00                              | 8.40                     | 8.80                          | 1830.00              | 144.00              | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 9            | 1076.00                             | -0.00                              | 11.10                    | 7.10                          | 2868.00              | 47.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 10           | 852.00                              | -0.00                              | 8.90                     | 7.80                          | 18273.00             | 34.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 577.27                             | 187.23                             | 0.0                                 | 1753.58                             | 0.38                               | 0.38                                | -0.00                   | -0.00                   | 0.0                      | -0.00                    | -0.00                   | -0.00                    |
| 2            | 642.26                             | 145.49                             | 0.0                                 | 1765.98                             | 0.65                               | 0.65                                | 14707.70                | 3331.64                 | 0.0                      | 40440.92                 | 14.87                   | 14.87                    |
| 3            | 1092.98                            | 20.06                              | 0.0                                 | 1401.89                             | 1.30                               | 1.30                                | 51916.43                | 953.00                  | 0.0                      | 66589.63                 | 61.78                   | 61.78                    |
| 4            | 1045.66                            | 18.51                              | 0.0                                 | 1480.48                             | 1.09                               | 1.09                                | 47786.85                | 846.02                  | 0.0                      | 67658.00                 | 50.03                   | 50.03                    |
| 5            | 1068.64                            | 17.61                              | 0.0                                 | 1446.86                             | 1.06                               | 1.06                                | 46913.41                | 772.90                  | 0.0                      | 63517.33                 | 46.73                   | 46.73                    |
| 6            | 525.53                             | 11.83                              | 0.0                                 | 2316.07                             | 22.28                              | 22.28                               | 67425.69                | 1517.34                 | 0.0                      | 297151.31                | 2857.90                 | 2857.90                  |
| 7            | 911.18                             | 11.66                              | 0.0                                 | 1710.57                             | 4.02                               | 4.02                                | 104148.13               | 1333.17                 | 0.0                      | 195518.19                | 459.89                  | 459.89                   |
| 8            | 976.24                             | 12.18                              | 0.0                                 | 1606.93                             | 2.75                               | 2.75                                | 102993.19               | 1285.07                 | 0.0                      | 169531.38                | 290.01                  | 290.01                   |
| 9            | 1213.01                            | 17.95                              | 0.0                                 | 1219.09                             | 0.84                               | 0.84                                | 68292.19                | 1010.58                 | 0.0                      | 68634.88                 | 47.50                   | 47.50                    |
| 10           | 970.46                             | 114.12                             | 0.0                                 | 1336.36                             | 0.61                               | 0.61                                | 20476.79                | 2407.84                 | 0.0                      | 28197.11                 | 12.85                   | 12.85                    |

LTD CYCLE EMISSIONS

| TEST<br>MODE | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|--------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2            | 12.00                   | 22.90                          | 4.58                 | 642.26                 | 14707.70             | 2.942                  | 145.49                 | 3331.64              | 0.666                  | 0.65                   | 14.87                | 0.0030                 |
| 6            | 0.30                    | 128.30                         | 0.64                 | 525.53                 | 67425.69             | 0.337                  | 11.83                  | 1517.34              | 0.008                  | 22.28                  | 2857.90              | 0.0143                 |
| 7            | 5.00                    | 114.30                         | 9.49                 | 911.18                 | 104148.13            | 8.644                  | 11.66                  | 1333.17              | 0.111                  | 4.02                   | 459.89               | 0.0382                 |
| 9            | 6.00                    | 56.30                          | 5.63                 | 1213.01                | 68292.19             | 6.829                  | 17.95                  | 1010.58              | 0.101                  | 0.84                   | 47.50                | 0.0047                 |
| 10           | 4.00                    | 21.10                          | 1.41                 | 970.46                 | 20476.79             | 1.372                  | 114.12                 | 2407.84              | 0.161                  | 0.61                   | 12.85                | 0.0009                 |

|                         |  |  |        |  |  |        |  |  |       |  |  |        |
|-------------------------|--|--|--------|--|--|--------|--|--|-------|--|--|--------|
| TOTAL FOR CYCLE         |  |  | 21.752 |  |  | 20.124 |  |  | 1.047 |  |  | 0.0610 |
| TOTAL FOR CYCLE/LB FUEL |  |  |        |  |  | 0.925  |  |  | 0.048 |  |  | 0.0028 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 244 ENGINE TYPE AND MODEL: IO-540-C4B5 SERIAL NUMBER: L-6246-48AA

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1747. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 29.82 FINISH 29.82

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 135.00                        | 0.08444           |
| IDLE/TAXI   |                 | 2            | -0.0          | 17.60                          | 194.00                        | 0.07694           |
| RUN UP      |                 | 3            | -0.0          | 56.30                          | 605.00                        | 0.07852           |
| RUN UP-LEAN |                 | 4            | -0.0          | 56.30                          | 613.00                        | 0.07740           |
| RUN UP-RICH |                 | 5            | -0.0          | 57.40                          | 632.00                        | 0.08301           |
| TAKE-OFF    |                 | 6            | -0.0          | 117.20                         | 1261.00                       | 0.09688           |
| CLIMB       |                 | 7            | -0.0          | 105.50                         | 1138.00                       | 0.08237           |
| DESCENT     |                 | 8            | -0.0          | 78.50                          | 847.00                        | 0.07789           |
| APPROACH    |                 | 9            | -0.0          | 46.90                          | 512.00                        | 0.07518           |
| TAXI        |                 | 10           | -0.0          | 17.60                          | 149.00                        | 0.08555           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SNOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 740.00                              | -0.00                              | 9.50                     | 5.60                          | 29243.00             | 7.00                | -0.00                    | -0.00                    | 28.00              | -0.00 | -0.00        |
| 2            | 762.00                              | -0.00                              | 8.50                     | 7.10                          | 9411.00              | 24.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 3            | 1211.00                             | -0.00                              | 9.80                     | 6.70                          | 3417.00              | 65.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1278.00                             | -0.00                              | 9.40                     | 6.90                          | 3193.00              | 53.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1256.00                             | -0.00                              | 10.00                    | 7.60                          | 2745.00              | 50.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1323.00                             | -0.00                              | 12.30                    | 8.30                          | 3081.00              | 84.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1244.00                             | -0.00                              | 10.30                    | 7.10                          | 2969.00              | 58.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 9.70                     | 6.70                          | 3081.00              | 60.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 7.10                     | 6.70                          | 3305.00              | 67.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 795.00                              | -0.00                              | 10.30                    | 5.00                          | 29075.00             | 10.00               | -0.00                    | -0.00                    | 22.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1064.80                            | 187.72                             | 0.0                                 | 986.21                              | 0.13                               | 0.13                                | 16184.92                | 2853.34                 | 0.0                      | 14990.40                 | 1.96                    | 1.96                     |
| 2            | 1038.14                            | 65.83                              | 0.0                                 | 1362.49                             | 0.48                               | 0.48                                | 18271.27                | 1158.59                 | 0.0                      | 23979.82                 | 8.47                    | 8.47                     |
| 3            | 1175.55                            | 23.48                              | 0.0                                 | 1262.78                             | 1.28                               | 1.28                                | 66183.56                | 1321.64                 | 0.0                      | 71094.63                 | 72.10                   | 72.10                    |
| 4            | 1142.66                            | 22.23                              | 0.0                                 | 1317.88                             | 1.06                               | 1.06                                | 64331.74                | 1251.53                 | 0.0                      | 74196.69                 | 59.58                   | 59.58                    |
| 5            | 1130.23                            | 17.77                              | 0.0                                 | 1349.65                             | 0.93                               | 0.93                                | 64875.35                | 1019.92                 | 0.0                      | 77469.56                 | 53.28                   | 53.28                    |
| 6            | 1188.48                            | 17.05                              | 0.0                                 | 1260.10                             | 1.33                               | 1.33                                | 139290.06               | 1998.26                 | 0.0                      | 147683.31                | 156.25                  | 156.25                   |
| 7            | 1175.82                            | 19.41                              | 0.0                                 | 1273.51                             | 1.09                               | 1.09                                | 124049.25               | 2047.92                 | 0.0                      | 134354.89                | 114.74                  | 114.74                   |
| 8            | 1172.86                            | 21.34                              | 0.0                                 | 1272.88                             | 1.19                               | 1.19                                | 92069.50                | 1674.87                 | 0.0                      | 99921.13                 | 93.54                   | 93.54                    |
| 9            | 1139.71                            | 23.71                              | 0.0                                 | 1318.46                             | 1.38                               | 1.38                                | 53452.51                | 1111.84                 | 0.0                      | 61835.74                 | 64.64                   | 64.64                    |
| 10           | 1142.85                            | 184.76                             | 0.0                                 | 871.69                              | 0.18                               | 0.18                                | 20114.12                | 3251.84                 | 0.0                      | 15341.65                 | 3.21                    | 3.21                     |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 17.60                          | 3.52                 | 1038.14                | 18271.27             | 3.654                  | 65.83                  | 1158.59              | 0.232                  | 0.48                   | 8.47                 | 0.0017                 |
| 6                       | 0.30            | 117.20                         | 0.59                 | 1188.48                | 139290.06            | 0.696                  | 17.05                  | 1998.26              | 0.010                  | 1.33                   | 156.25               | 0.0008                 |
| 7                       | 5.00            | 105.50                         | 8.76                 | 1175.82                | 124049.25            | 10.296                 | 19.41                  | 2047.92              | 0.170                  | 1.09                   | 114.74               | 0.0095                 |
| 9                       | 6.00            | 46.90                          | 4.69                 | 1139.71                | 53452.51             | 5.345                  | 23.71                  | 1111.84              | 0.111                  | 1.38                   | 64.64                | 0.0065                 |
| 10                      | 4.00            | 17.60                          | 1.18                 | 1142.85                | 20114.12             | 1.348                  | 184.76                 | 3251.84              | 0.218                  | 0.18                   | 3.21                 | 0.0002                 |
| TOTAL FOR CYCLE         |                 |                                | 18.732               |                        |                      | 21.340                 |                        |                      | 0.741                  |                        |                      | 0.0187                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 1.139                  |                        |                      | 0.040                  |                        |                      | 0.0010                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 245 ENGINE TYPE AND MODEL: IO-540-C485 SERIAL NUMBER: L-6246-488  
RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1746. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.82 FINISH 29.82

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | 17.60                          | 128.00                        | 0.08173           |
| IOLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 195.00                        | 0.07451           |
| RUN UP      |                 | 3            | -0.0          | 52.70                          | 572.00                        | 0.07261           |
| RUN UP-LEAN |                 | 4            | -0.0          | 51.60                          | 562.00                        | 0.07237           |
| RUN UP-RICH |                 | 5            | -0.0          | 51.60                          | 563.00                        | 0.07148           |
| TAKE-OFF    |                 | 6            | -0.0          | 140.60                         | 1488.00                       | 0.08428           |
| CLIMB       |                 | 7            | -0.0          | 111.30                         | 1165.00                       | 0.08426           |
| DESCENT     |                 | 8            | -0.0          | 99.60                          | 1053.00                       | 0.08958           |
| APPROACH    |                 | 9            | -0.0          | 60.90                          | 644.00                        | 0.08464           |
| TAXI        |                 | 10           | -0.0          | 15.20                          | 124.00                        | 0.09538           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 572.00                              | -0.00                              | 7.30                     | 4.50                          | 55740.00             | 15.00               | -0.00                    | -0.00                    | 40.00              | -0.00 | -0.00        |
| 2            | 684.00                              | -0.00                              | 7.50                     | 6.30                          | 21680.00             | 40.00               | -0.00                    | -0.00                    | 31.00              | -0.00 | -0.00        |
| 3            | 1143.00                             | -0.00                              | 8.80                     | 6.40                          | 3585.00              | 76.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1143.00                             | -0.00                              | 8.40                     | 6.40                          | 7115.00              | 59.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1177.00                             | -0.00                              | 8.60                     | 6.40                          | 3193.00              | 61.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 10.90                    | 6.90                          | 2857.00              | 78.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1278.00                             | -0.00                              | 11.10                    | 6.70                          | 2633.00              | 43.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |
| 8            | 1244.00                             | -0.00                              | 11.70                    | 7.30                          | 2521.00              | 47.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1087.00                             | -0.00                              | 11.00                    | 6.90                          | 2633.00              | 47.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 762.00                              | -0.00                              | 11.60                    | 5.10                          | 35965.00             | -0.00               | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 848.84                             | 371.21                             | 0.0                                 | 822.15                              | 0.29                               | 0.29                                | 14939.54                | 6533.21                 | 0.0                      | 14469.89                 | 5.04                    | 5.04                     |
| 2            | 948.88                             | 157.09                             | 0.0                                 | 1252.36                             | 0.83                               | 0.83                                | 18882.75                | 3126.14                 | 0.0                      | 24922.01                 | 16.54                   | 16.54                    |
| 3            | 1142.66                            | 26.66                              | 0.0                                 | 1305.73                             | 1.62                               | 1.62                                | 60218.15                | 1405.01                 | 0.0                      | 68811.81                 | 85.42                   | 85.42                    |
| 4            | 1094.03                            | 53.07                              | 0.0                                 | 1309.68                             | 1.26                               | 1.26                                | 56451.69                | 2738.53                 | 0.0                      | 67579.63                 | 65.13                   | 65.13                    |
| 5            | 1134.13                            | 24.12                              | 0.0                                 | 1326.12                             | 1.32                               | 1.32                                | 58520.89                | 1244.39                 | 0.0                      | 68427.50                 | 68.18                   | 68.18                    |
| 6            | 1217.57                            | 18.28                              | 0.0                                 | 1211.03                             | 1.43                               | 1.43                                | 171189.88               | 2569.85                 | 0.0                      | 170270.31                | 201.22                  | 201.22                   |
| 7            | 1241.45                            | 16.87                              | 0.0                                 | 1177.38                             | 0.79                               | 0.79                                | 138172.81               | 1877.14                 | 0.0                      | 131042.69                | 87.92                   | 87.92                    |
| 8            | 1227.75                            | 15.15                              | 0.0                                 | 1203.61                             | 0.81                               | 0.81                                | 122283.75               | 1509.04                 | 0.0                      | 119879.31                | 80.69                   | 80.69                    |
| 9            | 1223.49                            | 16.77                              | 0.0                                 | 1205.85                             | 0.86                               | 0.86                                | 74510.38                | 1021.46                 | 0.0                      | 73436.38                 | 52.29                   | 52.29                    |
| 10           | 1154.62                            | 205.02                             | 0.0                                 | 797.61                              | -0.00                              | -0.00                               | 17550.20                | 3116.38                 | 0.0                      | 12123.64                 | -0.00                   | -0.00                    |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 19.90                          | 3.98                 | 948.88                 | 18882.75             | 3.777                  | 157.09                 | 3126.14              | 0.625                  | 0.83                   | 16.54                | 0.0033                 |
| 6                       | 0.30                    | 140.60                         | 0.70                 | 1217.57                | 171189.88            | 0.856                  | 18.28                  | 2569.85              | 0.013                  | 1.43                   | 201.22               | 0.0010                 |
| 7                       | 5.00                    | 111.30                         | 9.24                 | 1241.45                | 138172.81            | 11.468                 | 16.87                  | 1877.14              | 0.156                  | 0.79                   | 87.92                | 0.0073                 |
| 9                       | 6.00                    | 60.90                          | 6.09                 | 1223.49                | 74510.38             | 7.451                  | 16.77                  | 1021.46              | 0.102                  | 0.86                   | 52.29                | 0.0052                 |
| 10                      | 4.00                    | 15.20                          | 1.02                 | 1154.62                | 17550.20             | 1.176                  | 205.02                 | 3116.38              | 0.209                  | -0.00                  | -0.00                | -0.0000                |
| TOTAL FOR CYCLE         |                         |                                | 21.029               |                        |                      | 24.728                 |                        |                      | 1.105                  |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.176                  |                        |                      | 0.053                  |                        |                      | -0.0000                |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 246 ENGINE TYPE AND MODEL: IO-540-C485 SERIAL NUMBER: L-6246-48C

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1748. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.82 FINISH 29.82

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 55.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 17.60                          | 117.00                        | 0.08453           |
| IDLE/TAXI   |                 | 2            | -0.0          | 21.10                          | 210.00                        | 0.06886           |
| RUN UP      |                 | 3            | -0.0          | 56.30                          | 597.00                        | 0.07640           |
| RUN UP-LEAN |                 | 4            | -0.0          | 56.30                          | 609.00                        | 0.07548           |
| RUN UP-RICH |                 | 5            | -0.0          | 56.30                          | 599.00                        | 0.07725           |
| TAKE-OFF    |                 | 6            | -0.0          | 140.60                         | 1460.00                       | 0.09057           |
| CLIMB       |                 | 7            | -0.0          | 111.30                         | 1143.00                       | 0.09548           |
| DESCENT     |                 | 8            | -0.0          | 96.10                          | 1005.00                       | 0.09106           |
| APPROACH    |                 | 9            | -0.0          | 63.30                          | 662.00                        | 0.08664           |
| TAXI        |                 | 10           | -0.0          | 15.20                          | 125.00                        | 0.09154           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 560.00                              | -0.00                              | 6.30                     | 4.40                          | 72686.00             | 23.00               | -0.00                    | -0.00                    | 42.00              | -0.00 | -0.00        |
| 2            | 650.00                              | -0.00                              | 5.60                     | 6.60                          | 25881.00             | 52.00               | -0.00                    | -0.00                    | 31.00              | -0.00 | -0.00        |
| 3            | 1110.00                             | -0.00                              | 9.70                     | 6.30                          | 3585.00              | 62.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1110.00                             | -0.00                              | 9.20                     | 6.60                          | 3865.00              | 100.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1132.00                             | -0.00                              | 9.80                     | 6.40                          | 3473.00              | 67.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1289.00                             | -0.00                              | 12.10                    | 7.00                          | 3361.00              | 32.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1256.00                             | -0.00                              | 13.10                    | 7.10                          | 2913.00              | 17.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 8            | 1256.00                             | -0.00                              | 12.10                    | 7.20                          | 2577.00              | 19.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 11.50                    | 6.80                          | 2801.00              | 19.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 751.00                              | -0.00                              | 10.60                    | 5.20                          | 36973.00             | 8.00                | -0.00                    | -0.00                    | 31.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 708.32                             | 468.04                             | 0.0                                 | 777.28                              | 0.42                               | 0.42                                | 12466.39                | 8237.51                 | 0.0                      | 13680.16                 | 7.48                    | 7.48                     |
| 2            | 765.03                             | 202.50                             | 0.0                                 | 1416.68                             | 1.17                               | 1.17                                | 16142.09                | 4272.66                 | 0.0                      | 29891.91                 | 24.62                   | 24.62                    |
| 3            | 1197.93                            | 25.36                              | 0.0                                 | 1222.47                             | 1.26                               | 1.26                                | 67443.19                | 1427.58                 | 0.0                      | 68824.81                 | 70.81                   | 70.81                    |
| 4            | 1148.25                            | 27.63                              | 0.0                                 | 1294.29                             | 2.05                               | 2.05                                | 64646.50                | 1555.43                 | 0.0                      | 72868.44                 | 115.42                  | 115.42                   |
| 5            | 1196.47                            | 24.28                              | 0.0                                 | 1227.70                             | 1.34                               | 1.34                                | 67361.06                | 1367.20                 | 0.0                      | 69119.56                 | 75.64                   | 75.64                    |
| 6            | 1257.70                            | 20.01                              | 0.0                                 | 1143.22                             | 0.55                               | 0.55                                | 176833.06               | 2813.14                 | 0.0                      | 160736.50                | 76.82                   | 76.82                    |
| 7            | 1291.53                            | 16.45                              | 0.0                                 | 1049.84                             | 0.28                               | 0.28                                | 143747.06               | 1830.68                 | 0.0                      | 122412.06                | 30.64                   | 30.64                    |
| 8            | 1249.88                            | 15.25                              | 0.0                                 | 1168.57                             | 0.32                               | 0.32                                | 120113.75               | 1465.10                 | 0.0                      | 112299.50                | 30.98                   | 30.98                    |
| 9            | 1250.41                            | 17.44                              | 0.0                                 | 1161.72                             | 0.34                               | 0.34                                | 79150.69                | 1104.12                 | 0.0                      | 73536.69                 | 21.48                   | 21.48                    |
| 10           | 1098.33                            | 219.41                             | 0.0                                 | 846.58                              | 0.14                               | 0.14                                | 16694.61                | 3335.04                 | 0.0                      | 12868.04                 | 2.07                    | 2.07                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USFO<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 21.10                          | 4.22                 | 765.03                 | 16142.09             | 3.228                  | 202.50                 | 4272.66              | 0.855                  | 1.17                   | 24.62                | 0.0049                 |
| 6                       | 0.30                    | 140.60                         | 0.70                 | 1257.70                | 176833.06            | 0.884                  | 20.01                  | 2813.14              | 0.014                  | 0.55                   | 76.82                | 0.0004                 |
| 7                       | 5.00                    | 111.30                         | 9.24                 | 1291.53                | 143747.06            | 11.931                 | 16.45                  | 1830.68              | 0.152                  | 0.28                   | 30.64                | 0.0025                 |
| 9                       | 6.00                    | 63.30                          | 6.33                 | 1250.41                | 79150.69             | 7.915                  | 17.44                  | 1104.12              | 0.110                  | 0.34                   | 21.48                | 0.0021                 |
| 10                      | 4.00                    | 15.20                          | 1.02                 | 1098.33                | 16694.61             | 1.119                  | 219.41                 | 3335.04              | 0.223                  | 0.14                   | 2.07                 | 0.0001                 |
| TOTAL FOR CYCLE         |                         |                                | 21.509               |                        |                      | 25.077                 |                        |                      | 1.354                  |                        |                      | 0.0101                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.166                  |                        |                      | 0.063                  |                        |                      | 0.0005                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 247 ENGINE TYPE AND MODEL: IO-540-C4B5 SERIAL NUMBER: L-6239-48A  
 RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1760. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 65.00 FINISH 70.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 95.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 19.30                          | 185.00                        | 0.08243           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.90                          | 280.00                        | 0.08929           |
| RUN UP      |                 | 3            | -0.0          | 61.50                          | 678.00                        | 0.07936           |
| RUN UP-LEAN |                 | 4            | -0.0          | 61.50                          | 677.00                        | 0.07887           |
| RUN UP-RICH |                 | 5            | -0.0          | 59.80                          | 655.00                        | 0.07884           |
| TAKE-OFF    |                 | 6            | -0.0          | 149.40                         | 1635.00                       | 0.08874           |
| CLIMB       |                 | 7            | -0.0          | 109.00                         | 1200.00                       | 0.08244           |
| DESCENT     |                 | 8            | -0.0          | 96.70                          | 1062.00                       | 0.08201           |
| APPROACH    |                 | 9            | -0.0          | 52.70                          | 579.00                        | 0.07758           |
| TAXI        |                 | 10           | -0.0          | 22.90                          | 252.00                        | 0.07748           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 852.00                              | -0.00                              | 9.50                     | 6.20                          | 19435.00             | 8.00                | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 2            | 830.00                              | -0.00                              | 6.00                     | 8.70                          | 3184.00              | 52.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 1267.00                             | -0.00                              | 9.50                     | 7.30                          | 2690.00              | 75.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1233.00                             | -0.00                              | 9.50                     | 7.20                          | 2580.00              | 66.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1390.00                             | -0.00                              | 9.60                     | 7.10                          | 2416.00              | 54.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1446.00                             | -0.00                              | 10.90                    | 8.00                          | 2361.00              | 56.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1412.00                             | -0.00                              | 9.90                     | 7.60                          | 2525.00              | 65.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1345.00                             | -0.00                              | 9.90                     | 7.50                          | 2525.00              | 65.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1199.00                             | -0.00                              | 9.30                     | 7.10                          | 2745.00              | 55.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 10           | 807.00                              | -0.00                              | 8.70                     | 7.10                          | 8564.00              | 36.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CD<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 1087.78                            | 127.45                             | 0.0                                 | 1115.44                             | 0.15                               | 0.15                                | 20994.13                | 2459.82                 | 0.0                      | 21528.01                 | 2.90                    | 2.90                     |
| 2            | 807.10                             | 24.53                              | 0.0                                 | 1838.81                             | 1.15                               | 1.15                                | 18482.66                | 561.74                  | 0.0                      | 42108.63                 | 26.31                   | 26.31                    |
| 3            | 1124.39                            | 18.23                              | 0.0                                 | 1357.55                             | 1.46                               | 1.46                                | 69150.00                | 1121.41                 | 0.0                      | 83489.13                 | 89.67                   | 89.67                    |
| 4            | 1131.75                            | 17.60                              | 0.0                                 | 1347.72                             | 1.29                               | 1.29                                | 69602.69                | 1082.60                 | 0.0                      | 82884.44                 | 79.43                   | 79.43                    |
| 5            | 1144.77                            | 16.50                              | 0.0                                 | 1330.28                             | 1.06                               | 1.06                                | 68457.25                | 986.71                  | 0.0                      | 79550.88                 | 63.25                   | 63.25                    |
| 6            | 1150.73                            | 14.28                              | 0.0                                 | 1327.02                             | 0.97                               | 0.97                                | 171919.56               | 2132.75                 | 0.0                      | 198256.31                | 145.08                  | 145.08                   |
| 7            | 1126.62                            | 16.46                              | 0.0                                 | 1358.92                             | 1.21                               | 1.21                                | 122801.56               | 1793.80                 | 0.0                      | 148122.25                | 132.43                  | 132.43                   |
| 8            | 1133.00                            | 16.55                              | 0.0                                 | 1348.64                             | 1.22                               | 1.22                                | 109561.25               | 1600.40                 | 0.0                      | 130413.06                | 118.16                  | 118.16                   |
| 9            | 1126.76                            | 19.05                              | 0.0                                 | 1351.59                             | 1.09                               | 1.09                                | 59380.32                | 1003.80                 | 0.0                      | 71228.88                 | 57.68                   | 57.68                    |
| 10           | 1055.21                            | 59.49                              | 0.0                                 | 1353.06                             | 0.72                               | 0.72                                | 24164.35                | 1362.32                 | 0.0                      | 30985.06                 | 16.42                   | 16.42                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00           | 22.90                          | 4.58                 | 807.10                 | 18482.66             | 3.697                  | 24.53                  | 561.74               | 0.112                  | 1.15                   | 26.31                | 0.0053                 |
| 6                       | 0.30            | 149.40                         | 0.75                 | 1150.73                | 171919.56            | 0.860                  | 14.28                  | 2132.75              | 0.011                  | 0.97                   | 145.08               | 0.0007                 |
| 7                       | 5.00            | 109.00                         | 9.05                 | 1126.62                | 122801.56            | 10.193                 | 16.46                  | 1793.80              | 0.149                  | 1.21                   | 132.43               | 0.0110                 |
| 9                       | 6.00            | 52.70                          | 5.27                 | 1126.76                | 59380.32             | 5.938                  | 19.05                  | 1003.80              | 0.100                  | 1.09                   | 57.68                | 0.0058                 |
| 10                      | 4.00            | 22.90                          | 1.53                 | 1055.21                | 24164.35             | 1.619                  | 59.49                  | 1362.32              | 0.091                  | 0.72                   | 16.42                | 0.0011                 |
| TOTAL FOR CYCLE         |                 |                                | 21.178               |                        |                      | 22.306                 |                        |                      | 0.464                  |                        |                      | 0.0238                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 1.053                  |                        |                      | 0.022                  |                        |                      | 0.0011                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 248 ENGINE TYPE AND MODEL: IO-540-C4B5 SERIAL NUMBER: L-6239-488

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1761. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 71.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.80

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 84.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 24.60                          | 235.00                        | 0.07321           |
| IDLE/TAXI   |                 | 2            | -0.0          | 24.60                          | 269.00                        | 0.06754           |
| RUN UP      |                 | 3            | -0.0          | 59.80                          | 653.00                        | 0.07587           |
| RUN UP-LEAN |                 | 4            | -0.0          | 61.50                          | 675.00                        | 0.07488           |
| RUN UP-RICH |                 | 5            | -0.0          | 58.00                          | 651.00                        | 0.08010           |
| TAKE-OFF    |                 | 6            | -0.0          | 133.60                         | 1459.00                       | 0.08488           |
| CLIMB       |                 | 7            | -0.0          | 105.50                         | 1157.00                       | 0.08111           |
| DESCENT     |                 | 8            | -0.0          | 96.70                          | 1056.00                       | 0.07936           |
| APPROACH    |                 | 9            | -0.0          | 58.00                          | 636.00                        | 0.07705           |
| TAXI        |                 | 10           | -0.0          | 22.90                          | 221.00                        | 0.07707           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 673.00                              | -0.00                              | 5.80                     | 6.70                          | 32281.00             | 32.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 2            | 773.00                              | -0.00                              | 5.80                     | 7.30                          | 14494.00             | 58.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 3            | 1300.00                             | -0.00                              | 9.20                     | 6.80                          | 2855.00              | 86.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1233.00                             | -0.00                              | 9.00                     | 6.80                          | 2745.00              | 58.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1368.00                             | -0.00                              | 9.20                     | 7.80                          | 2690.00              | 57.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1368.00                             | -0.00                              | 10.40                    | 7.60                          | 2745.00              | 58.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1356.00                             | -0.00                              | 9.80                     | 7.40                          | 2525.00              | 68.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1334.00                             | -0.00                              | 9.70                     | 7.10                          | 2525.00              | 62.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 9            | 1222.00                             | -0.00                              | 9.30                     | 7.00                          | 2525.00              | 56.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 807.00                              | -0.00                              | 7.80                     | 6.40                          | 23223.00             | 58.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 745.00                             | 237.48                             | 0.0                                 | 1352.19                             | 0.68                               | 0.68                                | 18326.87                | 5841.88                 | 0.0                      | 33263.93                 | 16.61                   | 16.61                    |
| 2            | 805.35                             | 115.26                             | 0.0                                 | 1592.64                             | 1.32                               | 1.32                                | 19811.60                | 2835.47                 | 0.0                      | 39178.92                 | 32.54                   | 32.54                    |
| 3            | 1141.27                            | 20.28                              | 0.0                                 | 1325.40                             | 1.75                               | 1.75                                | 68247.94                | 1212.98                 | 0.0                      | 79259.00                 | 104.79                  | 104.79                   |
| 4            | 1131.12                            | 19.76                              | 0.0                                 | 1342.80                             | 1.20                               | 1.20                                | 69563.56                | 1215.14                 | 0.0                      | 82582.19                 | 73.64                   | 73.64                    |
| 5            | 1076.27                            | 18.02                              | 0.0                                 | 1433.73                             | 1.10                               | 1.10                                | 62423.84                | 1045.35                 | 0.0                      | 83156.31                 | 63.53                   | 63.53                    |
| 6            | 1149.71                            | 17.38                              | 0.0                                 | 1320.10                             | 1.05                               | 1.05                                | 153601.69               | 2321.94                 | 0.0                      | 176365.88                | 140.71                  | 140.71                   |
| 7            | 1134.41                            | 16.74                              | 0.0                                 | 1345.90                             | 1.29                               | 1.29                                | 119680.31               | 1766.05                 | 0.0                      | 141992.81                | 136.40                  | 136.40                   |
| 8            | 1149.17                            | 17.13                              | 0.0                                 | 1321.63                             | 1.21                               | 1.21                                | 111125.00               | 1656.71                 | 0.0                      | 127801.69                | 116.67                  | 116.67                   |
| 9            | 1135.07                            | 17.65                              | 0.0                                 | 1342.38                             | 1.12                               | 1.12                                | 65833.81                | 1023.70                 | 0.0                      | 77857.88                 | 65.11                   | 65.11                    |
| 10           | 953.73                             | 162.63                             | 0.0                                 | 1229.56                             | 1.16                               | 1.16                                | 21840.42                | 3724.18                 | 0.0                      | 28156.90                 | 26.68                   | 26.68                    |

# LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 24.60                          | 4.92                 | 805.35                 | 19811.60             | 3.962                  | 115.26                 | 2835.47              | 0.567                  | 1.32                   | 32.54                | 0.0065                 |
| 6                       | 0.30                    | 133.60                         | 0.67                 | 1149.71                | 153601.69            | 0.768                  | 17.38                  | 2321.94              | 0.012                  | 1.05                   | 140.71               | 0.0007                 |
| 7                       | 5.09                    | 105.50                         | 8.76                 | 1134.41                | 119680.31            | 9.933                  | 16.74                  | 1766.05              | 0.147                  | 1.29                   | 136.40               | 0.0113                 |
| 9                       | 6.00                    | 58.00                          | 5.80                 | 1135.07                | 65833.81             | 6.583                  | 17.65                  | 1023.70              | 0.102                  | 1.12                   | 65.11                | 0.0065                 |
| 10                      | 4.00                    | 22.90                          | 1.53                 | 953.73                 | 21840.42             | 1.463                  | 162.63                 | 3724.18              | 0.250                  | 1.16                   | 26.68                | 0.0018                 |
| TOTAL FOR CYCLE         |                         |                                | 21.679               |                        |                      | 22.710                 |                        |                      | 1.077                  |                        |                      | 0.0268                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.048                  |                        |                      | 0.050                  |                        |                      | 0.0012                 |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 249 ENGINE TYPE AND MODEL: IO-540-C485 SERIAL NUMBER: L-6239-48C  
RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1741. HRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 71.00  
ATMOSPHERIC PRESSURE: START 29.73 FINISH 29.73  
INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02  
RELATIVE HUMIDITY: 98.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 24.60                          | 227.00                        | 0.08154           |
| IDLE/TAXI   |                 | 2            | -0.0          | 26.40                          | 315.00                        | 0.06984           |
| RUN UP      |                 | 3            | -0.0          | 61.50                          | 659.00                        | 0.08068           |
| RUN UP-LEAN |                 | 4            | -0.0          | 59.80                          | 644.00                        | 0.08102           |
| RUN UP-RICH |                 | 5            | -0.0          | 59.80                          | 643.00                        | 0.08125           |
| TAKE-OFF    |                 | 6            | -0.0          | 124.80                         | 1334.00                       | 0.09270           |
| CLIMB       |                 | 7            | -0.0          | 109.00                         | 1173.00                       | 0.08709           |
| DESCENT     |                 | 8            | -0.0          | 98.40                          | 1061.00                       | 0.08486           |
| APPROACH    |                 | 9            | -0.0          | 61.50                          | 662.00                        | 0.08002           |
| TAXI        |                 | 10           | -0.0          | 24.60                          | 239.00                        | 0.07935           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMDKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 673.00                              | -0.00                              | 8.30                     | 6.20                          | 29613.00             | 14.00               | -0.00                    | -0.00                    | 25.00              | -0.00 | -0.00        |
| 2            | 762.00                              | -0.00                              | 6.40                     | 8.10                          | 5934.00              | 47.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 3            | 1300.00                             | -0.00                              | 10.10                    | 6.80                          | 4104.00              | 70.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1211.00                             | -0.00                              | 10.10                    | 7.00                          | 2995.00              | 83.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1323.00                             | -0.00                              | 9.90                     | 6.90                          | 6433.00              | 55.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1368.00                             | -0.00                              | 11.90                    | 7.80                          | 2662.00              | 47.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1356.00                             | -0.00                              | 11.00                    | 7.50                          | 2385.00              | 54.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1334.00                             | -0.00                              | 10.70                    | 7.30                          | 2440.00              | 54.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1211.00                             | -0.00                              | 10.00                    | 6.90                          | 2773.00              | 52.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 10           | 785.00                              | -0.00                              | 8.70                     | 6.30                          | 19964.00             | 37.00               | -0.00                    | -0.00                    | 17.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 960.29                             | 196.22                             | 0.0                                 | 1127.08                             | 0.27                               | 0.27                                | 23623.17                | 4827.12                 | 0.0                      | 27726.18                 | 6.54                    | 6.54                     |
| 2            | 856.63                             | 45.49                              | 0.0                                 | 1703.48                             | 1.03                               | 1.03                                | 22615.09                | 1200.91                 | 0.0                      | 44971.97                 | 27.28                   | 27.28                    |
| 3            | 1178.74                            | 27.43                              | 0.0                                 | 1246.93                             | 1.34                               | 1.34                                | 72492.19                | 1687.03                 | 0.0                      | 76686.13                 | 82.53                   | 82.53                    |
| 4            | 1172.70                            | 19.92                              | 0.0                                 | 1277.03                             | 1.58                               | 1.58                                | 70127.31                | 1190.99                 | 0.0                      | 76366.38                 | 94.66                   | 94.66                    |
| 5            | 1146.59                            | 42.67                              | 0.0                                 | 1255.63                             | 1.05                               | 1.05                                | 68566.06                | 2551.72                 | 0.0                      | 75086.38                 | 62.57                   | 62.57                    |
| 6            | 1204.08                            | 15.43                              | 0.0                                 | 1240.05                             | 0.78                               | 0.78                                | 150268.63               | 1925.20                 | 0.0                      | 154758.31                | 97.49                   | 97.49                    |
| 7            | 1185.93                            | 14.73                              | 0.0                                 | 1270.48                             | 0.96                               | 0.96                                | 129266.56               | 1605.19                 | 0.0                      | 138481.88                | 104.23                  | 104.23                   |
| 8            | 1184.86                            | 15.47                              | 0.0                                 | 1270.11                             | 0.98                               | 0.98                                | 116589.75               | 1522.69                 | 0.0                      | 124979.13                | 96.65                   | 96.65                    |
| 9            | 1176.11                            | 18.68                              | 0.0                                 | 1275.07                             | 1.00                               | 1.00                                | 72330.63                | 1148.73                 | 0.0                      | 78416.81                 | 61.78                   | 61.78                    |
| 10           | 1034.10                            | 135.91                             | 0.0                                 | 1176.59                             | 0.72                               | 0.72                                | 25438.93                | 3343.28                 | 0.0                      | 28944.00                 | 17.77                   | 17.77                    |

LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 26.40                          | 5.28                 | 856.63                 | 22615.09             | 4.523                  | 45.49                  | 1200.91              | 0.240                  | 1.03                   | 27.28                | 0.0055                 |
| 6                       | 0.30                    | 124.80                         | 0.62                 | 1204.08                | 150268.63            | 0.751                  | 15.43                  | 1925.20              | 0.010                  | 0.78                   | 97.49                | 0.0005                 |
| 7                       | 5.00                    | 109.00                         | 9.05                 | 1185.93                | 129266.56            | 10.729                 | 14.73                  | 1605.19              | 0.133                  | 0.96                   | 104.23               | 0.0087                 |
| 9                       | 6.00                    | 61.50                          | 6.15                 | 1176.11                | 72330.63             | 7.233                  | 18.68                  | 1148.73              | 0.115                  | 1.00                   | 61.78                | 0.0062                 |
| 10                      | 4.00                    | 24.60                          | 1.65                 | 1034.10                | 25438.93             | 1.704                  | 135.91                 | 3343.28              | 0.224                  | 0.72                   | 17.77                | 0.0012                 |
| TOTAL FOR CYCLE         |                         |                                | 22.749               |                        |                      | 24.941                 |                        |                      | 0.722                  |                        |                      | 0.0220                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.096                  |                        |                      | 0.032                  |                        |                      | 0.0010                 |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 266 ENGINE TYPE AND MODEL: IO-540-C4B5 SERIAL NUMBER: L-1623-488

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1305. HRS

FUEL: AV GAS 100/130 FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 84.00

ATMOSPHERIC PRESSURE: START 29.89 FINISH 29.89

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 9

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 3.50                           | 26.00                         | 0.08784           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.80                          | 142.00                        | 0.08315           |
| RUN UP      |                 | 3            | -0.0          | 31.60                          | 306.00                        | 0.08863           |
| RUN UP-LEAN |                 | 4            | -0.0          | 29.90                          | 276.00                        | 0.09003           |
| RUN UP-RICH |                 | 5            | -0.0          | 29.90                          | 292.00                        | 0.08854           |
| TAKE-OFF    |                 | 6            | -0.0          | 109.00                         | 1047.00                       | 0.09541           |
| CLIMB       |                 | 7            | -0.0          | 49.20                          | 477.00                        | 0.09078           |
| APPROACH    |                 | 9            | -0.0          | 26.40                          | 256.00                        | 0.08978           |
| TAXI        |                 | 10           | -0.0          | 12.30                          | 121.00                        | 0.07770           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 650.00                              | -0.00                              | 8.50                     | 4.60                          | 55732.00             | 13.00               | -0.00                    | -0.00                    | 58.00              | -0.00 | -0.00        |
| 2            | 762.00                              | -0.00                              | 8.80                     | 5.90                          | 30777.00             | 28.00               | -0.00                    | -0.00                    | 60.00              | -0.00 | -0.00        |
| 3            | 1166.00                             | -0.00                              | 12.90                    | 5.40                          | 5767.00              | 9.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1289.00                             | -0.00                              | 12.20                    | 5.60                          | 13975.00             | 12.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1278.00                             | -0.00                              | 12.70                    | 5.60                          | 5767.00              | 7.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1289.00                             | -0.00                              | 14.20                    | 5.70                          | 4381.00              | 16.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1244.00                             | -0.00                              | 13.30                    | 5.60                          | 4492.00              | 12.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |
| 9            | 1121.00                             | -0.00                              | 13.00                    | 5.60                          | 5379.00              | 11.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 10           | 818.00                              | -0.00                              | 10.90                    | 5.00                          | 6322.00              | 11.00               | -0.00                    | -0.00                    | 41.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 919.61                             | 345.33                             | 0.0                                 | 781.95                              | 0.23                               | 0.23                                | 3219.63                 | 1208.65                 | 0.0                      | 2736.83                  | 0.81                    | 0.81                     |
| 2            | 1000.02                            | 200.31                             | 0.0                                 | 1053.46                             | 0.52                               | 0.52                                | 15800.33                | 3164.86                 | 0.0                      | 16644.61                 | 8.26                    | 8.26                     |
| 3            | 1380.59                            | 35.35                              | 0.0                                 | 908.05                              | 0.16                               | 0.16                                | 43626.71                | 1117.01                 | 0.0                      | 28694.24                 | 5.00                    | 5.00                     |
| 4            | 1283.86                            | 84.23                              | 0.0                                 | 925.94                              | 0.21                               | 0.21                                | 38387.34                | 2518.40                 | 0.0                      | 27685.65                 | 6.20                    | 6.20                     |
| 5            | 1359.19                            | 35.35                              | 0.0                                 | 941.68                              | 0.12                               | 0.12                                | 40639.71                | 1056.92                 | 0.0                      | 28156.14                 | 3.68                    | 3.68                     |
| 6            | 1410.52                            | 24.92                              | 0.0                                 | 889.62                              | 0.26                               | 0.26                                | 153746.94               | 2716.67                 | 0.0                      | 96968.56                 | 28.45                   | 28.45                    |
| 7            | 1388.64                            | 26.86                              | 0.0                                 | 918.68                              | 0.21                               | 0.21                                | 68321.19                | 1321.57                 | 0.0                      | 45199.16                 | 10.13                   | 10.13                    |
| 9            | 1372.31                            | 32.52                              | 0.0                                 | 928.82                              | 0.19                               | 0.19                                | 36228.86                | 858.53                  | 0.0                      | 24520.96                 | 5.04                    | 5.04                     |
| 10           | 1331.98                            | 44.25                              | 0.0                                 | 960.02                              | 0.22                               | 0.22                                | 16383.33                | 544.22                  | 0.0                      | 11808.22                 | 2.72                    | 2.72                     |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 15.80                          | 3.16                 | 1000.02                | 15800.33             | 3.160                  | 200.31                 | 3164.86              | 0.633                  | 0.52                   | 8.26                 | 0.0017                 |
| 6                       | 0.30                    | 109.00                         | 0.54                 | 1410.52                | 153746.94            | 0.769                  | 24.92                  | 2716.67              | 0.014                  | 0.26                   | 28.45                | 0.0001                 |
| 7                       | 5.00                    | 49.20                          | 4.08                 | 1388.64                | 68321.19             | 5.671                  | 26.86                  | 1321.57              | 0.110                  | 0.21                   | 10.13                | 0.0008                 |
| 9                       | 6.00                    | 26.40                          | 2.64                 | 1372.31                | 36228.86             | 3.623                  | 32.52                  | 858.53               | 0.086                  | 0.19                   | 5.04                 | 0.0005                 |
| 10                      | 4.00                    | 12.30                          | 0.82                 | 1331.98                | 16383.33             | 1.098                  | 44.25                  | 544.22               | 0.036                  | 0.22                   | 2.72                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 11.253               |                        |                      | 14.320                 |                        |                      | 0.879                  |                        |                      | 0.0033                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 1.273                  |                        |                      | 0.078                  |                        |                      | 0.0003                 |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 267 ENGINE TYPE AND MODEL: 1D-540-C485 SERIAL NUMBER: L-1623-40C

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1218. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.90 FINISH 29.90

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 92.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 8.80                           | 61.00                         | 0.09052           |
| IDLE/TAXI   |                 | 2            | -0.0          | 8.80                           | 74.00                         | 0.08654           |
| RUN UP      |                 | 3            | -0.0          | 29.90                          | 289.00                        | 0.09284           |
| RUN UP-LEAN |                 | 4            | -0.0          | 22.90                          | 193.00                        | 0.09070           |
| RUN UP-RICH |                 | 5            | -0.0          | 28.10                          | 275.00                        | 0.09079           |
| TAKE-OFF    |                 | 6            | -0.0          | 72.10                          | 700.00                        | 0.10011           |
| CLIMB       |                 | 7            | -0.0          | 52.70                          | 509.00                        | 0.09415           |
| DESCENT     |                 | 8            | -0.0          | 40.40                          | 393.00                        | 0.09225           |
| APPROACH    |                 | 9            | -0.0          | 26.40                          | 255.00                        | 0.09043           |
| TAXI        |                 | 10           | -0.0          | 10.50                          | 81.00                         | 0.09424           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 594.00                              | -0.00                              | 8.40                     | 4.40                          | 64260.00             | 26.00               | -0.00                    | -0.00                    | 70.00              | -0.00 | -0.00        |
| 2            | 717.00                              | -0.00                              | 8.90                     | 5.60                          | 39780.00             | 22.00               | -0.00                    | -0.00                    | 66.00              | -0.00 | -0.00        |
| 3            | 1166.00                             | -0.00                              | 13.50                    | 5.60                          | 6870.00              | 15.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1199.00                             | -0.00                              | 11.00                    | 5.20                          | 31140.00             | 15.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1256.00                             | -0.00                              | 13.00                    | 5.70                          | 6630.00              | 9.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 14.70                    | 6.20                          | 4830.00              | 16.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1244.00                             | -0.00                              | 13.90                    | 5.70                          | 4710.00              | 11.00               | -0.00                    | -0.00                    | 26.00              | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 13.50                    | 5.70                          | 4710.00              | 12.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 9            | 1099.00                             | -0.00                              | 13.20                    | 5.50                          | 5670.00              | 10.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 10           | 773.00                              | -0.00                              | 10.70                    | 4.70                          | 46260.00             | 9.00                | -0.00                    | -0.00                    | 42.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 882.66                             | 386.72                             | 0.0                                 | 726.45                              | 0.45                               | 0.45                                | 7767.38                 | 3403.15                 | 0.0                      | 6392.73                  | 3.95                    | 3.95                     |
| 2            | 973.05                             | 249.09                             | 0.0                                 | 962.00                              | 0.40                               | 0.40                                | 8562.88                 | 2192.00                 | 0.0                      | 8465.56                  | 3.48                    | 3.48                     |
| 3            | 1378.34                            | 40.17                              | 0.0                                 | 898.36                              | 0.25                               | 0.25                                | 41212.29                | 1201.14                 | 0.0                      | 26860.82                 | 7.52                    | 7.52                     |
| 4            | 1150.60                            | 186.55                             | 0.0                                 | 854.62                              | 0.26                               | 0.26                                | 26348.62                | 4271.98                 | 0.0                      | 19570.71                 | 5.90                    | 5.90                     |
| 5            | 1356.35                            | 39.62                              | 0.0                                 | 934.42                              | 0.15                               | 0.15                                | 38113.48                | 1113.25                 | 0.0                      | 26257.20                 | 4.33                    | 4.33                     |
| 6            | 1388.83                            | 26.14                              | 0.0                                 | 920.37                              | 0.25                               | 0.25                                | 100134.94               | 1884.35                 | 0.0                      | 66358.75                 | 17.90                   | 17.90                    |
| 7            | 1399.10                            | 27.15                              | 0.0                                 | 901.46                              | 0.18                               | 0.18                                | 73732.38                | 1430.90                 | 0.0                      | 47506.91                 | 9.58                    | 9.58                     |
| 8            | 1386.47                            | 27.70                              | 0.0                                 | 919.79                              | 0.20                               | 0.20                                | 56013.27                | 1119.24                 | 0.0                      | 37159.53                 | 8.18                    | 8.18                     |
| 9            | 1384.08                            | 34.05                              | 0.0                                 | 906.13                              | 0.17                               | 0.17                                | 36539.71                | 898.92                  | 0.0                      | 23921.72                 | 4.55                    | 4.55                     |
| 10           | 1079.42                            | 267.28                             | 0.0                                 | 744.98                              | 0.15                               | 0.15                                | 11333.93                | 2906.39                 | 0.0                      | 7822.27                  | 1.57                    | 1.57                     |

# LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LBS. | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LBS. | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LBS. | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|---------------------|----------------------|------------------------|---------------------|----------------------|------------------------|---------------------|----------------------|------------------------|
| 2                       | 12.00                   | 8.80                           | 1.76                 | 973.05              | 8562.88              | 1.713                  | 249.09              | 2192.00              | 0.438                  | 0.40                | 3.48                 | 0.0007                 |
| 6                       | 0.30                    | 72.10                          | 0.36                 | 1388.83             | 100134.94            | 0.501                  | 26.14               | 1884.35              | 0.009                  | 0.25                | 17.90                | 0.0001                 |
| 7                       | 5.00                    | 52.70                          | 4.37                 | 1399.10             | 73732.38             | 6.120                  | 27.15               | 1430.90              | 0.119                  | 0.18                | 9.58                 | 0.0008                 |
| 9                       | 6.00                    | 26.40                          | 2.64                 | 1384.08             | 36539.71             | 3.654                  | 34.05               | 898.92               | 0.090                  | 0.17                | 4.55                 | 0.0005                 |
| 10                      | 4.00                    | 10.50                          | 0.70                 | 1079.42             | 11333.93             | 0.759                  | 267.28              | 2806.39              | 0.188                  | 0.15                | 1.57                 | 0.0001                 |
| TOTAL FOR CYCLE         |                         |                                | 9.838                |                     |                      | 12.746                 |                     |                      | 0.845                  |                     |                      | 0.0021                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                     |                      | 1.296                  |                     |                      | 0.086                  |                     |                      | 0.0002                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 372 ENGINE TYPE AND MODEL: D-540-A1B5 SERIAL NUMBER: L-3141-40

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1133. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 30.29 FINISH 30.29

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 22.90                          | 244.00                        | 0.07009           |
| IDLE/TAXI   |                 | 2            | -0.0          | 26.40                          | 307.00                        | 0.07242           |
| RUN /P      |                 | 3            | -0.0          | 59.80                          | 702.00                        | 0.07933           |
| RUN UP-LEAN |                 | 4            | -0.0          | 56.30                          | 661.00                        | 0.07918           |
| RUN UP-RICH |                 | 5            | -0.0          | 43.90                          | 515.00                        | 0.07867           |
| TAKE-OFF    |                 | 6            | -0.0          | 109.00                         | 1275.00                       | 0.08028           |
| CLIMB       |                 | 7            | -0.0          | 91.40                          | 1100.00                       | 0.07978           |
| DESCENT     |                 | 8            | -0.0          | 75.60                          | 956.00                        | 0.07475           |
| DESCENT     | ON              | 8            | -0.0          | 87.90                          | 917.00                        | 0.08614           |
| APPROACH    |                 | 9            | -0.0          | 56.30                          | 665.00                        | 0.07747           |
| TAXI        |                 | 10           | -0.0          | 26.40                          | 306.00                        | 0.07909           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 639.00                              | -0.00                              | 6.40                     | 7.10                          | 15801.00             | 9.00                | -0.00                    | -0.00                    | 23.00              | -0.00 | -0.00        |
| 2            | 650.00                              | -0.00                              | 7.10                     | 7.80                          | 7274.00              | 21.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 3            | 852.00                              | -0.00                              | 8.10                     | 8.80                          | 2870.00              | 212.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 729.00                              | -0.00                              | 8.10                     | 8.80                          | 2536.00              | 128.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 818.00                              | -0.00                              | 8.10                     | 8.70                          | 2369.00              | 127.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1480.00                             | -0.00                              | 8.30                     | 8.80                          | 2926.00              | 322.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1480.00                             | -0.00                              | 7.60                     | 9.50                          | 2425.00              | 350.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1446.00                             | -0.00                              | 5.90                     | 10.20                         | 2090.00              | 899.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1300.00                             | -0.00                              | 11.40                    | 6.70                          | 3651.00              | 155.00              | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 9            | 1222.00                             | -0.00                              | 7.70                     | 8.80                          | 2870.00              | 265.00              | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 10           | 796.00                              | -0.00                              | 7.80                     | 8.40                          | 9057.00              | 32.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 857.39                             | 121.23                             | 0.0                                 | 1494.49                             | 0.20                               | 0.20                                | 19634.18                | 2776.28                 | 0.0                      | 34223.89                 | 4.54                    | 4.54                     |
| 2            | 917.85                             | 53.86                              | 0.0                                 | 1584.34                             | 0.45                               | 0.45                                | 24231.32                | 1421.80                 | 0.0                      | 41826.50                 | 11.77                   | 11.77                    |
| 3            | 952.11                             | 19.32                              | 0.0                                 | 1625.26                             | 4.09                               | 4.09                                | 56934.13                | 1155.39                 | 0.0                      | 97190.44                 | 244.77                  | 244.77                   |
| 4            | 953.96                             | 17.11                              | 0.0                                 | 1628.42                             | 2.48                               | 2.48                                | 53708.11                | 963.05                  | 0.0                      | 91680.19                 | 139.41                  | 139.41                   |
| 5            | 960.50                             | 16.09                              | 0.0                                 | 1620.95                             | 2.47                               | 2.47                                | 42165.83                | 706.29                  | 0.0                      | 71159.50                 | 108.59                  | 108.59                   |
| 6            | 964.09                             | 19.47                              | 0.0                                 | 1606.05                             | 6.14                               | 6.14                                | 105085.25               | 2121.70                 | 0.0                      | 175059.00                | 669.64                  | 669.64                   |
| 7            | 885.33                             | 16.18                              | 0.0                                 | 1738.81                             | 6.70                               | 6.70                                | 80918.81                | 1478.74                 | 0.0                      | 158927.13                | 612.10                  | 612.10                   |
| 8            | 730.85                             | 14.83                              | 0.0                                 | 1985.24                             | 18.29                              | 18.29                               | 52522.01                | 1120.95                 | 0.0                      | 150084.00                | 1382.85                 | 1382.85                  |
| 8            | 1247.25                            | 22.88                              | 0.0                                 | 1151.76                             | 2.79                               | 2.79                                | 109633.56               | 2010.93                 | 0.0                      | 101239.94                | 244.84                  | 244.84                   |
| 9            | 926.66                             | 19.78                              | 0.0                                 | 1663.99                             | 5.24                               | 5.24                                | 52170.82                | 1113.60                 | 0.0                      | 93682.38                 | 294.92                  | 294.92                   |
| 10           | 921.20                             | 61.26                              | 0.0                                 | 1558.76                             | 0.62                               | 0.62                                | 24317.76                | 1617.31                 | 0.0                      | 41151.20                 | 16.39                   | 16.39                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 26.40                          | 5.28                 | 917.85                 | 24231.32             | 4.846                  | 53.86                  | 1421.80              | 0.284                  | 0.45                   | 11.77                | 0.0024                 |
| 6                       | 0.30                    | 109.00                         | 0.54                 | 964.09                 | 105085.25            | 0.525                  | 19.47                  | 2121.70              | 0.011                  | 6.14                   | 669.64               | 0.0033                 |
| 7                       | 5.00                    | 91.40                          | 7.59                 | 885.33                 | 80918.81             | 6.716                  | 16.18                  | 1478.74              | 0.123                  | 6.70                   | 612.10               | 0.0508                 |
| 9                       | 6.00                    | 56.30                          | 5.63                 | 926.66                 | 52170.82             | 5.217                  | 19.78                  | 1113.69              | 0.111                  | 5.24                   | 294.92               | 0.0295                 |
| 10                      | 4.00                    | 26.40                          | 1.77                 | 921.20                 | 24319.76             | 1.629                  | 61.26                  | 1617.31              | 0.108                  | 0.62                   | 16.39                | 0.0011                 |
| TOTAL FOR CYCLE         |                         |                                | 20.810               |                        |                      | 18.934                 |                        |                      | 0.637                  |                        |                      | 0.0871                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.910                  |                        |                      | 0.031                  |                        |                      | 0.0042                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 373 ENGINE TYPE AND MODEL: O-540-A1B5

SERIAL NUMBER: L-3141-40A

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1133. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 86.50 FINISH 83.00

ATMOSPHERIC PRESSURE: START 30.29 FINISH 30.29

INLET AIR HUMIDITY, GRAM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 36.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.0C, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 19.30                          | 230.00                        | 0.06411           |
| IDLE/TAXI   |                 | 2            | -0.0          | 26.40                          | 313.00                        | 0.07458           |
| RUN UP      |                 | 3            | -0.0          | 59.80                          | 402.00                        | 0.07790           |
| RUN UP-LEAN |                 | 4            | -0.0          | 59.80                          | 703.00                        | 0.07944           |
| RUN UP-RICH |                 | 5            | -0.0          | 40.40                          | 477.00                        | 0.07848           |
| TAKE-OFF    |                 | 6            | -0.0          | 110.80                         | 1291.00                       | 0.08034           |
| CLIMB       |                 | 7            | -0.0          | 84.40                          | 1082.00                       | 0.07218           |
| DESCENT     |                 | 8            | -0.0          | 65.00                          | 812.00                        | 0.07425           |
| DESCENT     | ON              | 9            | -0.0          | 77.40                          | 804.00                        | 0.08597           |
| APPROACH    |                 | 10           | -0.0          | 58.00                          | 548.00                        | 0.09150           |
| TAXI        |                 |              |               | 26.40                          | 305.00                        | 0.07886           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 4.20                     | 8.50                          | 11918.00             | 13.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 2            | 706.00                              | -0.00                              | 6.90                     | 8.50                          | 7449.00              | 25.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 986.00                              | -0.00                              | 7.90                     | 8.60                          | 3642.00              | 259.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 975.00                              | -0.00                              | 8.00                     | 8.90                          | 3200.00              | 149.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 886.00                              | -0.00                              | 7.90                     | 8.80                          | 3035.00              | 139.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1457.00                             | -0.00                              | 8.30                     | 8.70                          | 3973.00              | 283.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1480.00                             | -0.00                              | 5.20                     | 10.30                         | 2593.00              | 2026.00             | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 8            | 1390.00                             | -0.00                              | 6.10                     | 9.80                          | 2704.00              | 851.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 1256.00                             | -0.00                              | 11.40                    | 6.60                          | 4193.00              | 157.00              | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 10           | 1110.00                             | -0.00                              | 13.70                    | 5.10                          | 6566.00              | 34.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 796.00                              | -0.00                              | 7.90                     | 8.30                          | 8497.00              | 35.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 610.79                             | 99.26                              | 0.0                                 | 1942.23                             | 0.31                               | 0.31                                | 11788.26                | 1915.79                 | 0.0                      | 37484.98                 | 5.99                    | 5.99                     |
| 2            | 863.41                             | 53.38                              | 0.0                                 | 1671.18                             | 0.51                               | 0.51                                | 22793.93                | 1409.33                 | 0.0                      | 44119.20                 | 13.57                   | 13.57                    |
| 3            | 946.38                             | 24.99                              | 0.0                                 | 1618.72                             | 5.10                               | 5.10                                | 56593.20                | 1494.25                 | 0.0                      | 96799.63                 | 304.76                  | 304.76                   |
| 4            | 938.55                             | 21.50                              | 0.0                                 | 1640.58                             | 2.87                               | 2.87                                | 56125.43                | 1285.77                 | 0.0                      | 98106.50                 | 171.70                  | 171.70                   |
| 5            | 938.62                             | 20.65                              | 0.0                                 | 1642.80                             | 2.71                               | 2.71                                | 37920.30                | 834.35                  | 0.0                      | 66369.06                 | 109.59                  | 109.59                   |
| 6            | 963.82                             | 26.42                              | 0.0                                 | 1587.37                             | 5.40                               | 5.40                                | 106791.75               | 2927.68                 | 0.0                      | 175880.25                | 598.09                  | 598.09                   |
| 7            | 666.60                             | 19.04                              | 0.0                                 | 2074.63                             | 42.66                              | 42.66                               | 56261.37                | 1606.77                 | 0.0                      | 175098.50                | 3600.53                 | 3600.53                  |
| 8            | 762.10                             | 19.35                              | 0.0                                 | 1923.74                             | 17.46                              | 17.46                               | 49536.39                | 1257.61                 | 0.0                      | 125042.75                | 1135.13                 | 1135.13                  |
| 9            | 1250.36                            | 26.34                              | 0.0                                 | 1137.39                             | 2.83                               | 2.83                                | 96777.44                | 2038.63                 | 0.0                      | 88034.25                 | 218.92                  | 218.92                   |
| 10           | 1422.51                            | 39.05                              | 0.0                                 | 832.04                              | 0.58                               | 0.58                                | 82505.69                | 2264.69                 | 0.0                      | 48258.27                 | 33.63                   | 33.63                    |
| 10           | 936.08                             | 57.66                              | 0.0                                 | 1545.26                             | 0.68                               | 0.68                                | 24712.46                | 1522.30                 | 0.0                      | 40794.83                 | 17.98                   | 17.98                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 26.40                          | 5.28                 | 863.41                 | 22793.93             | 4.559                  | 53.38                  | 1409.33              | 0.282                  | 0.51                   | 13.57                | 0.0027                 |
| 6                       | 0.30                    | 110.80                         | 0.55                 | 963.82                 | 106791.75            | 0.534                  | 26.42                  | 2927.68              | 0.015                  | 5.40                   | 598.09               | 0.0030                 |
| 7                       | 5.00                    | 84.40                          | 7.01                 | 666.60                 | 56261.37             | 4.670                  | 19.04                  | 1606.77              | 0.133                  | 42.66                  | 3600.53              | 0.2988                 |
| 9                       | 6.00                    | 58.00                          | 5.80                 | 1422.51                | 82505.69             | 8.251                  | 39.05                  | 2264.69              | 0.226                  | 0.58                   | 33.63                | 0.0034                 |
| 10                      | 4.00                    | 26.40                          | 1.77                 | 936.08                 | 24712.46             | 1.656                  | 57.66                  | 1522.30              | 0.102                  | 0.68                   | 17.98                | 0.0012                 |
| TOTAL FOR CYCLE         |                         |                                | 20.408               |                        |                      | 19.669                 |                        |                      | 0.758                  |                        |                      | 0.3091                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.964                  |                        |                      | 0.037                  |                        |                      | 0.0151                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 374 ENGINE TYPE AND MODEL: D-540-A185

SERIAL NUMBER: L-3141-40B

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1133. MRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 30.29 FINISH 30.29

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 38.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 22.90                          | 229.00                        | 0.06351           |
| IDLE/TAXI   |                 | 2            | -0.0          | 24.60                          | 299.00                        | 0.07207           |
| RUN UP      |                 | 3            | -0.0          | 58.00                          | 684.00                        | 0.07574           |
| RUN UP-LEAN |                 | 4            | -0.0          | 61.50                          | 730.00                        | 0.07636           |
| RUN UP-RICH |                 | 5            | -0.0          | 40.40                          | 478.00                        | 0.07548           |
| TAKE-OFF    |                 | 6            | -0.0          | 114.30                         | 1343.00                       | 0.07837           |
| CLIMB       |                 | 7            | -0.0          | 87.90                          | 1075.00                       | 0.07386           |
| DESCENT     |                 | 8            | -0.0          | 75.90                          | 954.00                        | 0.07127           |
| DESCENT     | ON              | 8            | -0.0          | 77.40                          | 799.00                        | 0.08297           |
| APPROACH    |                 | 9            | -0.0          | 58.00                          | 670.00                        | 0.07594           |
| TAXI        |                 | 10           | -0.0          | 26.40                          | 303.00                        | 0.07738           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 5.16                                | -0.00                              | 3.60                     | 9.60                          | 6318.00              | 31.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 2            | 560.00                              | -0.00                              | 6.20                     | 8.80                          | 6262.00              | 38.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 1076.00                             | -0.00                              | 7.60                     | 8.50                          | 2897.00              | 301.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1121.00                             | -0.00                              | 7.60                     | 8.70                          | 2400.00              | 213.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1121.00                             | -0.00                              | 7.60                     | 8.50                          | 2345.00              | 194.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1300.00                             | -0.00                              | 8.00                     | 8.70                          | 2731.00              | 368.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1189.00                             | -0.00                              | 6.60                     | 9.20                          | 2400.00              | 669.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 8            | 1244.00                             | -0.00                              | 5.60                     | 9.70                          | 2179.00              | 1067.00             | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1031.00                             | -0.00                              | 11.10                    | 6.30                          | 3559.00              | 238.00              | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1031.00                             | -0.00                              | 8.10                     | 8.00                          | 2952.00              | 281.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 7.80                     | 8.00                          | 9076.00              | 63.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 525.81                             | 52.85                              | 0.0                                 | 2203.09                             | 0.74                               | 0.74                                | 12040.95                | 1210.27                 | 0.0                      | 50450.79                 | 17.03                   | 17.03                    |
| 2            | 801.57                             | 46.37                              | 0.0                                 | 1787.60                             | 0.81                               | 0.81                                | 19718.55                | 1140.62                 | 0.0                      | 43974.84                 | 16.85                   | 19.85                    |
| 3            | 936.79                             | 20.45                              | 0.0                                 | 1646.22                             | 6.09                               | 6.09                                | 54334.09                | 1186.18                 | 0.0                      | 95480.75                 | 353.46                  | 353.46                   |
| 4            | 928.28                             | 16.79                              | 0.0                                 | 1669.64                             | 4.27                               | 4.27                                | 57089.34                | 1032.52                 | 0.0                      | 102683.00                | 262.81                  | 262.81                   |
| 5            | 939.96                             | 16.61                              | 0.0                                 | 1651.78                             | 3.94                               | 3.94                                | 37974.39                | 671.07                  | 0.0                      | 66732.00                 | 159.22                  | 159.22                   |
| 6            | 952.21                             | 18.62                              | 0.0                                 | 1627.04                             | 7.19                               | 7.19                                | 108837.00               | 2127.91                 | 0.0                      | 185970.56                | 877.35                  | 822.35                   |
| 7            | 831.27                             | 17.31                              | 0.0                                 | 1820.64                             | 13.84                              | 13.84                               | 73068.44                | 1521.75                 | 0.0                      | 160034.00                | 1216.56                 | 1216.56                  |
| 8            | 729.05                             | 16.25                              | 0.0                                 | 1984.17                             | 22.82                              | 22.82                               | 55334.80                | 1233.14                 | 0.0                      | 150598.44                | 1731.79                 | 1731.79                  |
| 8            | 1262.94                            | 23.19                              | 0.0                                 | 1126.26                             | 4.45                               | 4.45                                | 97751.31                | 1795.04                 | 0.0                      | 87172.31                 | 344.27                  | 344.27                   |
| 9            | 998.09                             | 20.83                              | 0.0                                 | 1548.86                             | 5.69                               | 5.69                                | 57889.28                | 1208.30                 | 0.0                      | 89834.13                 | 329.87                  | 329.87                   |
| 10           | 943.15                             | 62.85                              | 0.0                                 | 1519.90                             | 1.25                               | 1.25                                | 24899.25                | 1659.32                 | 0.0                      | 40125.44                 | 33.03                   | 33.03                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 24.60                          | 4.92                 | 801.57                 | 19718.55             | 3.944                  | 46.37                  | 1140.62              | 0.228                  | 0.81                   | 19.85                | 0.0040                 |
| 6                       | 0.30                    | 114.30                         | 0.57                 | 952.21                 | 108837.00            | 0.544                  | 18.62                  | 2127.91              | 0.011                  | 7.19                   | 822.35               | 0.0041                 |
| 7                       | 5.00                    | 87.90                          | 7.30                 | 831.27                 | 73068.44             | 6.065                  | 17.31                  | 1521.75              | 0.126                  | 13.84                  | 1216.56              | 0.1010                 |
| 9                       | 6.00                    | 58.00                          | 5.80                 | 998.09                 | 57889.28             | 5.789                  | 20.83                  | 1208.30              | 0.121                  | 5.69                   | 329.87               | 0.0330                 |
| 10                      | 4.00                    | 26.40                          | 1.77                 | 943.15                 | 24899.25             | 1.668                  | 62.85                  | 1659.32              | 0.111                  | 1.25                   | 33.03                | 0.0022                 |
| TOTAL FOR CYCLE         |                         |                                | 20.356               |                        |                      | 18.010                 |                        |                      | 0.597                  |                        |                      | 0.1443                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.885                  |                        |                      | 0.029                  |                        |                      | 0.0071                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL IO NUMBER: 375 ENGINE TYPE AND MODEL: O-540-A1B5 SERIAL NUMBER: L-3454-40

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 932. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 70.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 30.28 FINISH 30.28

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 57.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 21.10                          | 224.00                        | 0.08193           |
| IDLE/TAXI   |                 | 2            | -0.0          | 24.60                          | 289.00                        | 0.07488           |
| RUN UP      |                 | 3            | -0.0          | 52.70                          | 641.00                        | 0.07996           |
| RUN UP-LEAN |                 | 4            | -0.0          | 47.50                          | 587.00                        | 0.07786           |
| RUN UP-RICH |                 | 5            | -0.0          | 52.70                          | 654.00                        | 0.07856           |
| TAKE-OFF    |                 | 6            | -0.0          | 110.80                         | 1207.00                       | 0.09862           |
| CLIMB       |                 | 7            | -0.0          | 110.80                         | 1279.00                       | 0.08521           |
| DESCENT     |                 | 8            | -0.0          | 77.40                          | 1032.00                       | 0.07583           |
| DESCENT     | ON              | 9            | -0.0          | 84.40                          | 828.00                        | 0.09400           |
| APPROACH    |                 | 9            | -0.0          | 58.00                          | 70.00                         | 0.08091           |
| TAXI        |                 | 10           | -0.0          | 22.90                          | 271.00                        | 0.07601           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 706.00                              | -0.00                              | 6.20                     | 8.90                          | 26715.00             | 15.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 2            | 773.00                              | -0.00                              | 5.70                     | 9.40                          | 11819.00             | 38.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 3            | 1278.00                             | -0.00                              | 7.10                     | 9.70                          | 5991.00              | 209.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1334.00                             | -0.00                              | 6.50                     | 10.00                         | 4695.00              | 152.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1312.00                             | -0.00                              | 6.50                     | 10.20                         | 4372.00              | 109.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1379.00                             | -0.00                              | 10.80                    | 9.60                          | 10200.00             | 276.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1424.00                             | -0.00                              | 8.90                     | 8.90                          | 6638.00              | 171.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 8            | 1558.00                             | -0.00                              | 4.20                     | 12.00                         | 4857.00              | 1356.00             | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1278.00                             | -0.00                              | 12.30                    | 6.80                          | 10524.00             | 117.00              | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 9            | 1614.00                             | -0.00                              | 7.30                     | 9.60                          | 6962.00              | 247.00              | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 1323.00                             | -0.00                              | 5.70                     | 9.70                          | 11496.00             | 46.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 704.81                             | 173.93                             | 0.0                                 | 1589.67                             | 0.28                               | 0.28                                | 14871.39                | 3669.95                 | 0.0                      | 33541.95                 | 5.91                    | 5.91                     |
| 2            | 707.25                             | 83.99                              | 0.0                                 | 1832.58                             | 0.77                               | 0.77                                | 17398.28                | 2066.13                 | 0.0                      | 45081.43                 | 19.05                   | 19.05                    |
| 3            | 824.39                             | 39.84                              | 0.0                                 | 1769.64                             | 3.99                               | 3.99                                | 43445.42                | 2099.57                 | 0.0                      | 93260.06                 | 210.06                  | 210.06                   |
| 4            | 773.83                             | 32.01                              | 0.0                                 | 1870.56                             | 2.97                               | 2.97                                | 36756.97                | 1520.57                 | 0.0                      | 88851.44                 | 141.19                  | 141.19                   |
| 5            | 766.26                             | 29.52                              | 0.0                                 | 1889.30                             | 2.11                               | 2.11                                | 40381.82                | 1555.60                 | 0.0                      | 99565.94                 | 111.23                  | 111.23                   |
| 6            | 1018.61                            | 55.10                              | 0.0                                 | 1422.63                             | 4.28                               | 4.28                                | 112861.63               | 6104.75                 | 0.0                      | 157627.44                | 473.75                  | 473.75                   |
| 7            | 973.80                             | 41.60                              | 0.0                                 | 1530.06                             | 3.07                               | 3.07                                | 107897.25               | 4608.96                 | 0.0                      | 169530.75                | 340.52                  | 340.52                   |
| 8            | 508.52                             | 33.68                              | 0.0                                 | 2282.85                             | 26.97                              | 26.97                               | 39359.30                | 2606.82                 | 0.0                      | 176692.31                | 2087.27                 | 2087.27                  |
| 8            | 1233.05                            | 60.42                              | 0.0                                 | 1071.08                             | 1.93                               | 1.93                                | 104069.25               | 5099.69                 | 0.0                      | 90399.25                 | 162.60                  | 162.60                   |
| 9            | 838.12                             | 45.78                              | 0.0                                 | 1731.78                             | 4.66                               | 4.66                                | 48610.91                | 2655.16                 | 0.0                      | 100443.13                | 270.16                  | 270.16                   |
| 10           | 695.81                             | 80.37                              | 0.0                                 | 1860.48                             | 0.92                               | 0.92                                | 15933.98                | 1840.52                 | 0.0                      | 42604.90                 | 21.12                   | 21.12                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 24.60                          | 4.92                 | 707.25                 | 17398.28             | 3.480                  | 83.99                  | 2066.13              | 0.413                  | 0.77                   | 19.05                | 0.0038                 |
| 6                       | 0.30                    | 110.80                         | 0.55                 | 1018.61                | 112861.63            | 0.564                  | 55.10                  | 6104.75              | 0.031                  | 4.28                   | 473.75               | 0.0024                 |
| 7                       | 5.00                    | 110.80                         | 9.20                 | 973.80                 | 107897.25            | 8.955                  | 41.60                  | 4608.96              | 0.383                  | 3.07                   | 340.52               | 0.0283                 |
| 9                       | 4.00                    | 58.00                          | 5.80                 | 838.12                 | 48610.91             | 4.861                  | 45.78                  | 2655.16              | 0.266                  | 4.66                   | 270.16               | 0.0270                 |
| 10                      | 4.00                    | 22.90                          | 1.53                 | 695.81                 | 15933.98             | 1.068                  | 80.37                  | 1840.52              | 0.123                  | 0.92                   | 21.12                | 0.0014                 |
| TOTAL FOR CYCLE         |                         |                                | 22.005               |                        |                      | 18.928                 |                        |                      | 1.215                  |                        |                      | 0.0629                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.860                  |                        |                      | 0.055                  |                        |                      | 0.0029                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 376 ENGINE TYPE AND MODEL: O-540-A1B5 SERIAL NUMBER: L-3454-40A

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 932. MRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.50 FINISH 78.50

ATMOSPHERIC PRESSURE: START 30.28 FINISH 30.28

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 22.90                          | 279.00                        | 0.05483           |
| IDLE/TAXI   |                 | 2            | -0.0          | 22.90                          | 295.00                        | 0.06929           |
| RUN UP      |                 | 3            | -0.0          | 52.70                          | 640.00                        | 0.08065           |
| RUN UP-LEAN |                 | 4            | -0.0          | 47.50                          | 580.00                        | 0.07936           |
| RUN UP-RICH |                 | 5            | -0.0          | 52.70                          | 487.00                        | 0.06694           |
| TAKE-OFF    |                 | 6            | -0.0          | 109.00                         | 1262.00                       | 0.08615           |
| CLIMB       |                 | 7            | -0.0          | 80.90                          | 1067.00                       | 0.07564           |
| DESCENT     |                 | 8            | -0.0          | 70.30                          | 935.00                        | 0.07521           |
| DESCENT     | ON              | 8            | -0.0          | 72.10                          | 741.00                        | 0.08989           |
| APPROACH    |                 | 9            | -0.0          | 52.70                          | 625.00                        | 0.07979           |
| TAXI        |                 | 10           | -0.0          | 24.60                          | 312.00                        | 0.07022           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 493.00                              | -0.00                              | 2.10                     | 8.30                          | 14808.00             | 18.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 2            | 684.00                              | -0.00                              | 4.60                     | 10.10                         | 4177.00              | 42.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 3            | 1233.00                             | -0.00                              | 7.50                     | 9.80                          | 2549.00              | 193.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1267.00                             | -0.00                              | 7.20                     | 9.90                          | 1844.00              | 145.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1099.00                             | -0.00                              | 3.50                     | 6.70                          | 41984.00             | 87.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1278.00                             | -0.00                              | 9.30                     | 9.20                          | 1898.00              | 208.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1076.00                             | -0.00                              | 4.80                     | 11.70                         | 1193.00              | 1076.00             | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 4.50                     | 11.90                         | 1410.00              | 1184.00             | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1143.70                             | -0.00                              | 12.20                    | 6.70                          | 3634.00              | 117.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 1166.00                             | -0.00                              | 8.00                     | 9.10                          | 2115.00              | 222.00              | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 919.00                              | -0.00                              | 5.20                     | 9.70                          | 3905.00              | 59.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 357.09                             | 144.21                             | 0.0                                 | 2217.55                             | 0.50                               | 0.50                                | 8177.31                 | 3302.43                 | 0.0                      | 50781.77                 | 11.51                   | 11.51                    |
| 2            | 614.72                             | 31.97                              | 0.0                                 | 2120.68                             | 0.92                               | 0.92                                | 14076.97                | 732.08                  | 0.0                      | 48563.63                 | 21.11                   | 21.11                    |
| 3            | 863.11                             | 16.80                              | 0.0                                 | 1772.02                             | 3.65                               | 3.65                                | 45485.75                | 885.38                  | 0.0                      | 93385.25                 | 192.26                  | 192.26                   |
| 4            | 841.55                             | 12.34                              | 0.0                                 | 1818.11                             | 2.78                               | 2.78                                | 39971.63                | 586.34                  | 0.0                      | 86360.38                 | 132.23                  | 132.23                   |
| 5            | 491.08                             | 337.38                             | 0.0                                 | 1477.07                             | 2.01                               | 2.01                                | 25880.09                | 17779.80                | 0.0                      | 77841.50                 | 105.67                  | 105.67                   |
| 6            | 1005.26                            | 11.75                              | 0.0                                 | 1562.51                             | 3.69                               | 3.69                                | 109573.69               | 1280.75                 | 0.0                      | 170313.69                | 402.54                  | 402.54                   |
| 7            | 583.49                             | 8.31                               | 0.0                                 | 2234.67                             | 21.48                              | 21.48                               | 47203.95                | 671.93                  | 0.0                      | 180784.56                | 1738.08                 | 1738.08                  |
| 8            | 549.61                             | 9.86                               | 0.0                                 | 2283.63                             | 23.75                              | 23.75                               | 38637.39                | 693.36                  | 0.0                      | 160539.06                | 1669.81                 | 1669.81                  |
| 8            | 1279.47                            | 21.83                              | 0.0                                 | 1104.03                             | 2.02                               | 2.02                                | 92249.44                | 1573.74                 | 0.0                      | 79600.75                 | 145.31                  | 145.31                   |
| 9            | 933.59                             | 14.14                              | 0.0                                 | 1668.58                             | 4.26                               | 4.26                                | 49200.30                | 744.96                  | 0.0                      | 87934.06                 | 224.26                  | 224.26                   |
| 10           | 687.04                             | 29.55                              | 0.0                                 | 2013.68                             | 1.28                               | 1.28                                | 16901.23                | 726.91                  | 0.0                      | 49536.45                 | 31.50                   | 31.50                    |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 22.90                          | 4.58                 | 614.72                 | 14076.77             | 2.815                  | 31.97                  | 732.08               | 0.146                  | 0.92                   | 71.11                | 0.0042                 |
| 6                       | 0.30                    | 109.00                         | 0.54                 | 1005.26                | 109573.69            | 0.548                  | 11.75                  | 1280.75              | 0.006                  | 3.69                   | 402.54               | 0.0020                 |
| 7                       | 5.00                    | 80.90                          | 6.71                 | 583.49                 | 47203.95             | 3.918                  | 8.31                   | 671.93               | 0.056                  | 21.48                  | 1738.08              | 0.1443                 |
| 9                       | 6.00                    | 52.70                          | 5.27                 | 933.59                 | 49200.30             | 4.990                  | 14.14                  | 744.96               | 0.074                  | 4.26                   | 224.26               | 0.0224                 |
| 10                      | 4.00                    | 24.60                          | 1.65                 | 687.04                 | 16901.23             | 1.132                  | 29.55                  | 726.91               | 0.049                  | 1.28                   | 31.50                | 0.0021                 |
| TOTAL FOR CYCLE         |                         |                                | 18.758               |                        |                      | 13.334                 |                        |                      | 0.332                  |                        |                      | 0.1750                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.711                  |                        |                      | 0.018                  |                        |                      | 0.0093                 |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 377 ENGINE TYPE AND MODEL: O-540-A1B5 SERIAL NUMBER: L-3454-408

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 932. MRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 84.00

ATMOSPHERIC PRESSURE: START 30.29 FINISH 30.29

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 38.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 11

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 22.90                          | 290.00                        | 0.06703           |
| IDLE/TAXI   |                 | 2            | -0.0          | 24.60                          | 320.00                        | 0.06482           |
| RUN UP      |                 | 3            | -0.0          | 56.30                          | 678.00                        | 0.07688           |
| RUN UP-LEAN |                 | 4            | -0.0          | 49.20                          | 596.00                        | 0.07677           |
| RUN UP-RICH |                 | 5            | -0.0          | 52.70                          | 479.00                        | 0.06593           |
| TAKE-OFF    |                 | 6            | -0.0          | 110.80                         | 1388.00                       | 0.07059           |
| CLIMB       |                 | 7            | -0.0          | 109.00                         | 1253.00                       | 0.08091           |
| DESCENT     |                 | 8            | -0.0          | 70.30                          | 935.00                        | 0.07172           |
| DESCENT     |                 | 8            | -0.0          | 79.10                          | 812.00                        | 0.08647           |
| APPROACH    |                 | 9            | -0.0          | 51.00                          | 606.00                        | 0.07793           |
| TAXI        |                 | 10           | -0.0          | 29.90                          | 401.00                        | 0.06784           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-----------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 639.00                              | -0.00                              | 4.70                   | 9.30                        | 5742.00              | 34.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 2            | 751.00                              | -0.00                              | 4.20                   | 9.60                        | 3137.00              | 53.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 3            | 1200.00                             | -0.00                              | 7.30                   | 9.20                        | 1914.00              | 172.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1233.00                             | -0.00                              | 7.20                   | 9.30                        | 1755.00              | 138.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 953.00                              | -0.00                              | 4.30                   | 6.00                        | 38281.00             | 59.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1412.00                             | -0.00                              | 5.80                   | 9.40                        | 1489.00              | 197.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1323.00                             | -0.00                              | 8.80                   | 8.50                        | 2020.00              | 1478.00             | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1412.00                             | -0.00                              | 4.30                   | 11.30                       | 1329.00              | 1232.00             | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 11.80                  | 6.40                        | 3084.00              | 131.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 1166.00                             | -0.00                              | 7.70                   | 9.00                        | 2020.00              | 182.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 684.00                              | -0.00                              | 3.70                   | 10.90                       | 2605.00              | 94.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 651.50                             | 45.59                              | 0.0                                 | 2025.53                             | 0.77                               | 0.77                                | 14919.36                | 1043.90                 | 0.0                      | 46384.58                 | 17.73                   | 17.73                    |
| 2            | 601.19                             | 25.72                              | 0.0                                 | 2159.09                             | 1.25                               | 1.25                                | 14789.21                | 632.64                  | 0.0                      | 53113.54                 | 30.65                   | 30.65                    |
| 3            | 883.55                             | 13.27                              | 0.0                                 | 1749.59                             | 3.42                               | 3.42                                | 49743.94                | 746.97                  | 0.0                      | 98501.56                 | 192.52                  | 192.52                   |
| 4            | 872.28                             | 12.18                              | 0.0                                 | 1770.29                             | 2.75                               | 2.75                                | 42916.12                | 599.12                  | 0.0                      | 87098.19                 | 135.11                  | 135.11                   |
| 5            | 614.87                             | 313.51                             | 0.0                                 | 1348.06                             | 1.39                               | 1.39                                | 32403.87                | 16521.79                | 0.0                      | 71042.50                 | 73.03                   | 73.03                    |
| 6            | 763.40                             | 11.22                              | 0.0                                 | 1943.97                             | 4.26                               | 4.26                                | 86584.75                | 1243.67                 | 0.0                      | 215392.31                | 471.90                  | 471.90                   |
| 7            | 1015.77                            | 13.35                              | 0.0                                 | 1541.60                             | 28.02                              | 28.02                               | 110719.25               | 1455.58                 | 0.0                      | 168034.25                | 3054.47                 | 3054.47                  |
| 8            | 552.16                             | 9.77                               | 0.0                                 | 2279.87                             | 25.99                              | 25.99                               | 38816.51                | 687.10                  | 0.0                      | 160274.69                | 1826.75                 | 1826.75                  |
| 8            | 1288.00                            | 19.28                              | 0.0                                 | 1097.62                             | 2.35                               | 2.35                                | 101880.44               | 1524.99                 | 0.0                      | 86821.56                 | 185.78                  | 185.78                   |
| 9            | 920.35                             | 13.83                              | 0.0                                 | 1690.22                             | 3.57                               | 3.57                                | 46937.99                | 705.23                  | 0.0                      | 86201.44                 | 182.23                  | 182.23                   |
| 10           | 503.00                             | 20.28                              | 0.0                                 | 2328.27                             | 2.10                               | 2.10                                | 15039.77                | 606.45                  | 0.0                      | 69615.19                 | 62.76                   | 62.76                    |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 2                       | 12.00                   | 24.60                          | 4.92                 | 601.19                 | 14789.21             | 2.958                  | 25.72                  | 632.64               | 0.127                  | 1.25                   | 30.65                | 0.0061                 |
| 6                       | 0.30                    | 110.80                         | 0.55                 | 763.40                 | 84584.75             | 0.423                  | 11.22                  | 1243.67              | 0.006                  | 4.26                   | 471.90               | 0.0024                 |
| 7                       | 5.00                    | 109.00                         | 9.05                 | 1015.77                | 110719.25            | 9.190                  | 13.35                  | 1455.58              | 0.121                  | 28.02                  | 3054.47              | 0.2535                 |
| 9                       | 6.00                    | 51.00                          | 5.10                 | 920.35                 | 46937.99             | 4.694                  | 13.83                  | 705.23               | 0.071                  | 3.57                   | 182.23               | 0.0182                 |
| 10                      | 4.00                    | 29.90                          | 2.00                 | 503.00                 | 15039.77             | 1.008                  | 20.28                  | 606.45               | 0.041                  | 2.10                   | 62.76                | 0.0042                 |
| TOTAL FOR CYCLE         |                         |                                | 21.624               |                        |                      | 18.272                 |                        |                      | 0.365                  |                        |                      | 0.2844                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.845                  |                        |                      | 0.017                  |                        |                      | 0.0132                 |

## SUMMARY 0 - 200A

MODEL SUMMARY SAMPLE NUMBER = 19.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 7.68                     | 1.94           | 967.85           | 7519.03        | 1.504            | 27.07            | 213.94         | 0.0428           | 1.17             | 8.86           | 0.0018           |
|                         | STD DEV: | 1.34                     | 0.27           | 136.25           | 2147.27        | 0.429            | 10.67            | 131.95         | 0.0264           | 0.38             | 3.03           | 0.0006           |
| 6                       | MEAN:    | 48.41                    | 0.24           | 1109.63          | 54600.71       | 0.273            | 14.67            | 719.60         | 0.0036           | 6.00             | 258.93         | 0.0013           |
|                         | STD DEV: | 4.24                     | 0.02           | 232.11           | 12360.03       | 0.062            | 4.82             | 246.42         | 0.0012           | 8.56             | 265.29         | 0.0013           |
| 7                       | MEAN:    | 48.41                    | 4.02           | 1109.63          | 54600.71       | 4.532            | 14.67            | 719.60         | 0.0597           | 6.00             | 258.93         | 0.0215           |
|                         | STD DEV: | 4.24                     | 0.35           | 232.11           | 12360.03       | 1.026            | 4.82             | 246.42         | 0.0205           | 8.56             | 265.29         | 0.0220           |
| 9                       | MEAN:    | 21.29                    | 2.13           | 1117.45          | 23841.52       | 2.384            | 17.86            | 379.68         | 0.0380           | 2.43             | 51.76          | 0.0052           |
|                         | STD DEV: | 1.21                     | 0.12           | 61.01            | 2275.58        | 0.228            | 4.02             | 87.55          | 0.0088           | 1.34             | 29.77          | 0.0030           |
| 10                      | MEAN:    | 6.49                     | 0.44           | 998.81           | 6536.55        | 0.438            | 21.75            | 140.58         | 0.0094           | 1.46             | 9.50           | 0.0006           |
|                         | STD DEV: | 1.07                     | 0.07           | 114.70           | 1589.63        | 0.107            | 5.49             | 45.30          | 0.0030           | 0.47             | 3.46           | 0.0002           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 8.361          |                  |                | 9.131            |                  |                | 0.153            |                  |                | 0.0304           |
|                         |          | STD DEV:                 | 0.639          |                  |                | 1.524            |                  |                | 0.048            |                  |                | 0.0239           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 1.084            |                  |                | 0.018            |                  |                | 0.0038           |
|                         |          |                          |                |                  | STD DEV:       | 0.135            |                  |                | 0.005            |                  |                | 0.0038           |

## SUMMARY 0 - 320

MODEL SUMMARY SAMPLE NUMBER = 28.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 12.99                    | 2.60           | 835.02           | 11056.69       | 2.211            | 26.04            | 355.08         | 0.0710           | 1.03             | 12.53          | 0.0025           |
|                         | STD DEV: | 5.16                     | 1.03           | 234.46           | 6014.22        | 1.203            | 12.38            | 247.99         | 0.0496           | 0.72             | 10.87          | 0.0022           |
| 6                       | MEAN:    | 65.68                    | 0.33           | 1075.71          | 70926.00       | 0.355            | 22.27            | 1490.02        | 0.0075           | 3.23             | 213.51         | 0.0011           |
|                         | STD DEV: | 10.73                    | 0.05           | 156.55           | 16345.73       | 0.082            | 14.82            | 1094.05        | 0.0055           | 4.44             | 271.24         | 0.0014           |
| 7                       | MEAN:    | 63.54                    | 5.27           | 1022.85          | 65751.06       | 5.458            | 20.49            | 1309.65        | 0.1087           | 5.93             | 375.43         | 0.0312           |
|                         | STD DEV: | 10.95                    | 0.91           | 247.90           | 21934.26       | 1.821            | 13.72            | 971.72         | 0.0807           | 12.77            | 839.61         | 0.0697           |
| 9                       | MEAN:    | 23.13                    | 2.31           | 1027.34          | 24266.00       | 2.427            | 20.93            | 495.80         | 0.0496           | 2.26             | 51.42          | 0.0051           |
|                         | STD DEV: | 8.59                     | 0.86           | 124.59           | 10546.54       | 1.055            | 4.10             | 236.96         | 0.0237           | 1.52             | 50.03          | 0.0050           |
| 10                      | MEAN:    | 13.48                    | 0.90           | 714.86           | 10045.07       | 0.673            | 22.62            | 320.03         | 0.0214           | 1.59             | 21.92          | 0.0015           |
|                         | STD DEV: | 6.70                     | 0.45           | 228.47           | 6281.34        | 0.421            | 13.05            | 283.00         | 0.0190           | 1.11             | 24.82          | 0.0017           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 11.415         |                  |                | 11.123           |                  |                | 0.258            |                  |                | 0.0413           |
|                         |          | STD DEV:                 | 2.364          |                  |                | 2.916            |                  |                | 0.113            |                  |                | 0.0742           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.970            |                  |                | 0.022            |                  |                | 0.0035           |
|                         |          |                          |                |                  | STD DEV:       | 0.131            |                  |                | 0.009            |                  |                | 0.0056           |

## SUMMARY 10 - 360

MODEL SUMMARY SAMPLE NUMBER = 15.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 15.87                    | 3.17           | 848.18           | 13001.87       | 2.600            | 144.50           | 2259.32        | 0.4519           | 1.09             | 17.87          | 0.0036           |
|                         | STD DEV: | 4.76                     | 0.95           | 272.92           | 5783.23        | 1.157            | 136.44           | 2774.19        | 0.5548           | 0.87             | 16.75          | 0.0033           |
| 6                       | MEAN:    | 88.70                    | 0.44           | 1031.25          | 92088.13       | 0.460            | 22.47            | 2034.49        | 0.0102           | 5.32             | 474.50         | 0.0024           |
|                         | STD DEV: | 18.42                    | 0.09           | 133.90           | 24629.55       | 0.123            | 5.96             | 784.63         | 0.0039           | 4.97             | 486.96         | 0.0024           |
| 7                       | MEAN:    | 67.88                    | 5.63           | 971.97           | 67412.13       | 5.595            | 17.40            | 1196.83        | 0.0993           | 6.60             | 407.76         | 0.0338           |
|                         | STD DEV: | 13.79                    | 1.14           | 210.70           | 23895.07       | 1.983            | 3.33             | 395.98         | 0.0329           | 6.11             | 339.78         | 0.0282           |
| 9                       | MEAN:    | 33.51                    | 3.35           | 980.66           | 34420.59       | 3.442            | 22.80            | 772.36         | 0.0772           | 4.74             | 141.54         | 0.0142           |
|                         | STD DEV: | 8.46                     | 0.85           | 238.44           | 16140.19       | 1.614            | 6.03             | 313.61         | 0.0314           | 2.93             | 73.86          | 0.0074           |
| 10                      | MEAN:    | 15.96                    | 1.07           | 931.26           | 14212.80       | 0.952            | 182.26           | 2905.61        | 0.1947           | 0.86             | 13.57          | 0.0009           |
|                         | STD DEV: | 4.81                     | 0.32           | 341.25           | 6210.09        | 0.416            | 126.99           | 2763.99        | 0.1852           | 0.71             | 12.34          | 0.0008           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 13.671         |                  |                | 13.050           |                  |                | 0.833            |                  |                | 0.0548           |
|                         |          | STD DEV:                 | 2.441          |                  |                | 4.319            |                  |                | 0.764            |                  |                | 0.0356           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.947            |                  |                | 0.059            |                  |                | 0.0042           |
|                         |          |                          |                |                  | STD DEV:       | 0.214            |                  |                | 0.043            |                  |                | 0.0029           |

## SUMMARY 10 - 470

### MODEL SUMMARY

SAMPLE NUMBER = 12.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 21.53                    | 4.31           | 724.07           | 15383.41       | 3.077            | 101.89           | 2065.28        | 0.4131           | 0.95             | 20.87          | 0.0042           |
|                         | STD DEV: | 7.84                     | 1.57           | 175.94           | 6843.84        | 1.369            | 76.02            | 1786.88        | 0.3574           | 0.96             | 24.30          | 0.0049           |
| 6                       | MEAN:    | 104.69                   | 0.52           | 800.73           | 83614.44       | 0.418            | 30.88            | 3295.03        | 0.0165           | 6.86             | 712.99         | 0.0036           |
|                         | STD DEV: | 14.07                    | 0.07           | 123.41           | 16579.38       | 0.083            | 11.09            | 1375.73        | 0.0069           | 4.31             | 477.38         | 0.0024           |
| 7                       | MEAN:    | 80.24                    | 6.66           | 792.44           | 63485.63       | 5.269            | 18.10            | 1463.02        | 0.1214           | 5.90             | 467.62         | 0.0388           |
|                         | STD DEV: | 8.29                     | 0.69           | 72.98            | 8136.49        | 0.675            | 7.76             | 683.24         | 0.0567           | 3.02             | 237.77         | 0.0197           |
| 9                       | MEAN:    | 53.97                    | 5.40           | 965.91           | 52267.35       | 5.227            | 19.52            | 1058.83        | 0.1059           | 3.40             | 177.88         | 0.0178           |
|                         | STD DEV: | 9.13                     | 0.91           | 42.75            | 9956.32        | 0.996            | 3.80             | 313.66         | 0.0314           | 1.35             | 69.10          | 0.0069           |
| 10                      | MEAN:    | 21.68                    | 1.45           | 821.79           | 17858.19       | 1.196            | 188.31           | 3918.95        | 0.2626           | 0.64             | 14.97          | 0.0010           |
|                         | STD DEV: | 8.47                     | 0.57           | 137.06           | 7698.01        | 0.516            | 93.89            | 2759.22        | 0.1849           | 0.36             | 10.66          | 0.0007           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 18.340         |                  |                | 15.187           |                  |                | 0.919            |                  |                | 0.0653           |
|                         |          | STD DEV:                 | 3.511          |                  |                | 3.215            |                  |                | 0.560            |                  |                | 0.0283           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.830            |                  |                | 0.049            |                  |                | 0.0037           |
|                         |          |                          |                |                  | STD DEV:       | 0.075            |                  |                | 0.025            |                  |                | 0.0016           |

## SUMMARY 0 - 470

### MODEL SUMMARY

SAMPLE NUMBER = 2.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 15.85                    | 3.17           | 984.36           | 15696.43       | 3.139            | 54.03            | 887.93         | 0.1776           | 0.58             | 8.76           | 0.0018           |
|                         | STD DEV: | 1.20                     | 0.24           | 156.96           | 3671.08        | 0.734            | 52.54            | 897.76         | 0.1796           | 0.62             | 9.09           | 0.0018           |
| 6                       | MEAN:    | 103.25                   | 0.52           | 1012.71          | 104646.94      | 0.523            | 13.75            | 1416.04        | 0.0071           | 2.07             | 221.67         | 0.0011           |
|                         | STD DEV: | 7.85                     | 0.04           | 21.52            | 10170.77       | 0.051            | 4.69             | 4.69           | 0.0000           | 1.95             | 217.91         | 0.0011           |
| 7                       | MEAN:    | 86.15                    | 7.15           | 614.93           | 53209.41       | 4.416            | 7.77             | 660.81         | 0.0548           | 3.25             | 294.08         | 0.0244           |
|                         | STD DEV: | 21.00                    | 1.74           | 22.19            | 14825.50       | 1.231            | 0.83             | 91.97          | 0.0076           | 1.36             | 184.98         | 0.0154           |
| 9                       | MEAN:    | 43.40                    | 4.34           | 782.57           | 33909.88       | 3.391            | 8.83             | 382.50         | 0.0382           | 3.92             | 168.31         | 0.0168           |
|                         | STD DEV: | 1.98                     | 0.20           | 54.15            | 801.44         | 0.080            | 0.77             | 15.90          | 0.0016           | 1.91             | 75.25          | 0.0075           |
| 10                      | MEAN:    | 14.10                    | 0.94           | 974.76           | 14013.73       | 0.939            | 52.35            | 803.95         | 0.0539           | 0.38             | 4.90           | 0.0003           |
|                         | STD DEV: | 2.40                     | 0.16           | 224.28           | 5505.84        | 0.369            | 54.79            | 898.36         | 0.0602           | 0.39             | 4.64           | 0.0003           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 16.121         |                  |                | 12.409           |                  |                | 0.332            |                  |                | 0.0444           |
|                         |          | STD DEV:                 | 1.579          |                  |                | 0.099            |                  |                | 0.234            |                  |                | 0.0110           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.773            |                  |                | 0.021            |                  |                | 0.0027           |
|                         |          |                          |                |                  | STD DEV:       | 0.070            |                  |                | 0.017            |                  |                | 0.0004           |

## SUMMARY TSi0 - 520

### MODEL SUMMARY

SAMPLE NUMBER = 6.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 27.85                    | 5.57           | 602.78           | 17036.25       | 3.407            | 85.22            | 2196.34        | 0.4393           | 0.62             | 18.87          | 0.0038           |
|                         | STD DEV: | 6.90                     | 1.38           | 225.60           | 6879.25        | 1.376            | 59.07            | 1229.66        | 0.2459           | 0.34             | 12.62          | 0.0025           |
| 6                       | MEAN:    | 121.60                   | 0.61           | 464.11           | 57636.38       | 0.288            | 11.42            | 1402.19        | 0.0070           | 25.68            | 3030.31        | 0.0152           |
|                         | STD DEV: | 10.61                    | 0.05           | 138.19           | 20831.44       | 0.104            | 1.83             | 322.62         | 0.0016           | 10.80            | 999.79         | 0.0050           |
| 7                       | MEAN:    | 104.90                   | 8.71           | 774.84           | 83206.38       | 6.906            | 11.38            | 1711.74        | 0.1006           | 7.07             | 695.86         | 0.0578           |
|                         | STD DEV: | 12.42                    | 1.03           | 194.84           | 28889.20       | 2.398            | 1.85             | 321.54         | 0.0267           | 5.18             | 423.85         | 0.0352           |
| 9                       | MEAN:    | 58.32                    | 5.83           | 1043.90          | 60819.99       | 6.082            | 16.02            | 933.78         | 0.0934           | 2.03             | 119.05         | 0.0119           |
|                         | STD DEV: | 1.33                     | 0.13           | 173.74           | 9832.53        | 0.983            | 2.41             | 136.28         | 0.0136           | 1.25             | 73.92          | 0.0074           |
| 10                      | MEAN:    | 29.28                    | 1.96           | 910.84           | 26023.02       | 1.744            | 73.91            | 1860.05        | 0.1246           | 0.87             | 27.65          | 0.0019           |
|                         | STD DEV: | 10.36                    | 0.69           | 77.37            | 7269.30        | 0.487            | 36.71            | 422.84         | 0.0283           | 0.30             | 17.44          | 0.0012           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 22.678         |                  |                | 18.427           |                  |                | 0.765            |                  |                | 0.0904           |
|                         |          | STD DEV:                 | 1.230          |                  |                | 2.650            |                  |                | 0.277            |                  |                | 0.0484           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.817            |                  |                | 0.034            |                  |                | 0.0039           |
|                         |          |                          |                |                  | STD DEV:       | 0.142            |                  |                | 0.013            |                  |                | 0.0020           |

# SUMMARY 10 - 540

MODEL SUMMARY SAMPLE NUMBER = 7.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 19.60                    | 3.92           | 892.19           | 17097.97       | 3.420            | 129.00           | 2198.03        | 0.4396           | 0.87             | 18.71          | 0.0037           |
|                         | STD DEV: | 6.05                     | 1.21           | 109.31           | 4407.29        | 0.881            | 88.48            | 1316.39        | 0.2633           | 0.39             | 11.57          | 0.0023           |
| 6                       | MEAN:    | 120.96                   | 0.60           | 1250.01          | 149399.25      | 0.747            | 19.31            | 2256.04        | 0.0113           | 0.74             | 94.67          | 0.0005           |
|                         | STD DEV: | 25.54                    | 0.13           | 108.73           | 25252.25       | 0.126            | 4.62             | 377.75         | 0.0019           | 0.41             | 56.36          | 0.0003           |
| 7                       | MEAN:    | 91.74                    | 7.61           | 1243.15          | 111656.88      | 9.268            | 19.69            | 1685.16        | 0.1399           | 0.74             | 76.88          | 0.0064           |
|                         | STD DEV: | 27.96                    | 2.32           | 116.23           | 28862.23       | 2.396            | 5.19             | 249.79         | 0.0207           | 0.50             | 57.64          | 0.0048           |
| 9                       | MEAN:    | 47.89                    | 4.79           | 1226.35          | 57559.49       | 5.756            | 23.30            | 1021.38        | 0.1021           | 0.76             | 40.04          | 0.0040           |
|                         | STD DEV: | 15.67                    | 1.57           | 111.85           | 16682.53       | 1.668            | 7.15             | 110.38         | 0.0110           | 0.51             | 28.42          | 0.0028           |
| 10                      | MEAN:    | 18.00                    | 1.21           | 1099.37          | 19424.22       | 1.301            | 153.39           | 2623.89        | 0.1758           | 0.47             | 10.06          | 0.0007           |
|                         | STD DEV: | 5.60                     | 0.38           | 118.20           | 4951.68        | 0.332            | 81.07            | 1195.70        | 0.0801           | 0.40             | 10.11          | 0.0007           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 18.134         |                  |                | 20.491           |                  |                | 0.869            |                  |                | 0.0153           |
|                         |          | STD DEV:                 | 5.339          |                  |                | 4.964            |                  |                | 0.283            |                  |                | 0.0100           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 1.153            |                  |                | 0.053            |                  |                | 0.0008           |
|                         |          |                          |                |                  | STD DEV:       | 0.099            |                  |                | 0.024            |                  |                | 0.0004           |

# SUMMARY 0 - 540

MODEL SUMMARY SAMPLE NUMBER = 6.

| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 2                       | MEAN:    | 24.92                    | 4.98           | 751.00           | 18834.69       | 3.767            | 49.21            | 1233.77        | 0.2468           | 0.78             | 19.33          | 0.0039           |
|                         | STD DEV: | 1.32                     | 0.26           | 131.12           | 4162.94        | 0.833            | 20.52            | 525.50         | 0.1051           | 0.29             | 6.67           | 0.0013           |
| 6                       | MEAN:    | 110.78                   | 0.55           | 944.56           | 104622.31      | 0.523            | 23.76            | 2634.41        | 0.0132           | 5.16             | 573.04         | 0.0029           |
|                         | STD DEV: | 1.94                     | 0.01           | 92.53            | 10164.48       | 0.051            | 16.34            | 1811.92        | 0.0091           | 1.33             | 154.74         | 0.0008           |
| 7                       | MEAN:    | 94.07                    | 7.81           | 826.04           | 79344.81       | 6.586            | 19.30            | 1890.62        | 0.1569           | 19.30            | 1760.37        | 0.1461           |
|                         | STD DEV: | 12.77                    | 1.06           | 170.66           | 26105.00       | 2.167            | 11.55            | 1374.78        | 0.1141           | 14.69            | 1318.45        | 0.1094           |
| 9                       | MEAN:    | 55.67                    | 5.57           | 1006.55          | 56219.13       | 5.622            | 25.57            | 1448.67        | 0.1449           | 4.00             | 222.51         | 0.0223           |
|                         | STD DEV: | 3.08                     | 0.31           | 210.05           | 13442.22       | 1.344            | 13.52            | 817.24         | 0.0817           | 1.83             | 106.15         | 0.0106           |
| 10                      | MEAN:    | 26.10                    | 1.75           | 781.05           | 20301.05       | 1.360            | 52.00            | 1328.80        | 0.0890           | 1.14             | 30.46          | 0.0020           |
|                         | STD DEV: | 2.33                     | 0.16           | 180.76           | 4797.29        | 0.321            | 22.59            | 524.57         | 0.0351           | 0.54             | 17.27          | 0.0012           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 20.660         |                  |                | 17.858           |                  |                | 0.651            |                  |                | 0.1771           |
|                         |          | STD DEV:                 | 1.143          |                  |                | 2.291            |                  |                | 0.321            |                  |                | 0.1012           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.867            |                  |                | 0.031            |                  |                | 0.0086           |
|                         |          |                          |                |                  | STD DEV:       | 0.085            |                  |                | 0.014            |                  |                | 0.0049           |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 250 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-16344-27AA  
RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 720. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 29.84 FINISH 29.84

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 5

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 15.20                          | 181.00                        | 0.03369           |
| IDLE/TAXI   |                 | 2            | -0.0          | 18.80                          | 223.00                        | 0.04885           |
| RUN UP      |                 | 3            | -0.0          | 35.20                          | 397.00                        | 0.07349           |
| RUN UP-LEAN |                 | 4            | -0.0          | 35.20                          | 401.00                        | 0.07286           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.00                          | 388.00                        | 0.07283           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 314.00                              | -0.00                              | 3.10                     | 3.90                          | 1537.00              | 14.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 2            | 448.00                              | -0.00                              | 4.70                     | 5.60                          | 1482.00              | 24.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 3            | 1031.00                             | -0.00                              | 8.30                     | 7.30                          | 2141.00              | 31.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 964.00                              | -0.00                              | 8.10                     | 7.40                          | 1867.00              | 23.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1099.00                             | -0.00                              | 8.10                     | 7.40                          | 1812.00              | 22.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 875.45                             | 24.86                              | 0.0                                 | 1710.51                             | 0.65                               | 0.65                                | 13306.88                | 377.86                  | 0.0                      | 26303.74                 | 9.87                    | 9.87                     |
| 2            | 908.78                             | 16.41                              | 0.0                                 | 1701.32                             | 0.76                               | 0.76                                | 17085.02                | 308.54                  | 0.0                      | 31984.85                 | 14.33                   | 14.33                    |
| 3            | 1060.32                            | 15.66                              | 0.0                                 | 1465.27                             | 0.65                               | 0.65                                | 37323.13                | 551.39                  | 0.0                      | 51577.57                 | 22.90                   | 22.90                    |
| 4            | 1043.17                            | 13.77                              | 0.0                                 | 1497.41                             | 0.49                               | 0.49                                | 36719.59                | 484.73                  | 0.0                      | 52708.77                 | 17.13                   | 17.13                    |
| 5            | 1043.54                            | 13.37                              | 0.0                                 | 1497.93                             | 0.47                               | 0.47                                | 35480.24                | 454.57                  | 0.0                      | 50929.73                 | 15.83                   | 15.83                    |

DATE: 7/30/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 259 ENGINE TYPE AND MODEL: O-320-E2A SERIAL NUMBER: L-29302-27AA  
 RATED HORSEPOWER: 150.

ENGINE TOTAL TIME: 129. HRS

FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 86.00  
 ATMOSPHERIC PRESSURE: START 30.15 FINISH 30.15  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 45.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 8

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| RUN UP      |                 | 3            | -0.0          | 19.30                          | 220.00                        | 0.06862           |
| RUN UP-LEAN |                 | 4            | -0.0          | 19.30                          | 221.00                        | 0.06807           |
| TAKE-OFF    |                 | 6            | -0.0          | 42.20                          | 472.00                        | 0.07264           |
| CLIMB       |                 | 7            | -0.0          | 42.20                          | 472.00                        | 0.07264           |
| DESCENT     |                 | 8            | -0.0          | 24.60                          | 295.00                        | 0.06576           |
| DESCENT     | ON              | 8            | -0.0          | 24.60                          | 298.00                        | 0.06521           |
| APPROACH    |                 | 9            | -0.0          | 17.60                          | 196.00                        | 0.06850           |
| TAXI        |                 | 10           | -0.0          | 5.30                           | 65.00                         | 0.06121           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 3            | 1054.00                             | -0.00                              | 7.50                     | 7.00                          | 2506.00              | 104.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1076.00                             | -0.00                              | 7.40                     | 7.00                          | 2337.00              | 80.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1300.00                             | -0.00                              | 8.40                     | 7.00                          | 2112.00              | 8.00                | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1300.00                             | -0.00                              | 8.40                     | 7.00                          | 2112.00              | 8.00                | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 8            | 1233.00                             | -0.00                              | 6.30                     | 7.70                          | 1886.00              | 40.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 1211.00                             | -0.00                              | 6.00                     | 7.90                          | 1830.00              | 108.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 9            | 942.00                              | -0.00                              | 7.90                     | 6.50                          | 2900.00              | 66.00               | -0.00                    | -0.00                    | 7.00               | -0.00 | -0.00        |
| 10           | 471.00                              | -0.00                              | 5.30                     | 7.70                          | 2112.00              | 68.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 3            | 1027.20                            | 19.66                              | 0.0                                 | 1506.36                             | 2.34                               | 2.34                                | 19824.87                | 379.38                  | 0.0                      | 29072.69                 | 45.15                   | 45.15                    |
| 4            | 1021.60                            | 18.48                              | 0.0                                 | 1516.39                             | 1.81                               | 1.81                                | 19716.80                | 356.62                  | 0.0                      | 29304.96                 | 35.01                   | 35.01                    |
| 6            | 1087.04                            | 15.65                              | 0.0                                 | 1423.32                             | 0.17                               | 0.17                                | 45873.02                | 660.57                  | 0.0                      | 60064.01                 | 7.18                    | 7.18                     |
| 7            | 1087.04                            | 15.65                              | 0.0                                 | 1423.32                             | 0.17                               | 0.17                                | 45873.02                | 660.57                  | 0.0                      | 60064.01                 | 7.18                    | 7.18                     |
| 8            | 897.02                             | 15.38                              | 0.0                                 | 1727.63                             | 0.94                               | 0.94                                | 22066.71                | 378.34                  | 0.0                      | 42376.60                 | 23.01                   | 23.01                    |
| 8            | 860.71                             | 15.03                              | 0.0                                 | 1780.62                             | 2.54                               | 2.54                                | 21173.50                | 369.86                  | 0.0                      | 43803.31                 | 62.60                   | 62.60                    |
| 9            | 1086.44                            | 22.84                              | 0.0                                 | 1404.53                             | 1.49                               | 1.49                                | 19121.38                | 402.01                  | 0.0                      | 24719.74                 | 26.24                   | 26.24                    |
| 10           | 810.47                             | 18.50                              | 0.0                                 | 1850.07                             | 1.71                               | 1.71                                | 4295.47                 | 98.03                   | 0.0                      | 9805.38                  | 9.05                    | 9.05                     |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 363 ENGINE TYPE AND MODEL: ID-360-C SERIAL NUMBER: 90591-6CB

RATED HORSEPOWER: 210.

ENGINE TOTAL TIME: 700. MRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 84.00

ATMOSPHERIC PRESSURE: START 30.24 FINISH 30.24

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 66.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 8

COMMENTS:

APPROACH MODE MISSING

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 16.40                          | 199.00                        | 0.06361           |
| IDLE/TAXI   |                 | 2            | -0.0          | 19.90                          | 262.00                        | 0.06765           |
| RUN UP      |                 | 3            | -0.0          | 22.30                          | 293.00                        | 0.07011           |
| RUN UP-LEAN |                 | 4            | -0.0          | 19.90                          | 267.00                        | 0.06789           |
| RUN UP-RICH |                 | 5            | -0.0          | 19.90                          | 272.00                        | 0.06592           |
| TAKE-OFF    |                 | 6            | -0.0          | 91.40                          | 1076.00                       | 0.07859           |
| CLIMB       |                 | 7            | -0.0          | 59.80                          | 781.00                        | 0.07102           |
| DESCENT     |                 | 8            | -0.0          | 42.20                          | 538.00                        | 0.07248           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGR F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|----------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 673.00                           | -0.00                              | 2.80                     | 9.40                          | 16470.00             | 42.00               | -0.00                    | -0.00                    | 42.00              | -0.00 | -0.00        |
| 2            | 729.00                           | -0.00                              | 3.40                     | 10.40                         | 9882.00              | 56.00               | -0.00                    | -0.00                    | 35.00              | -0.00 | -0.00        |
| 3            | 919.00                           | -0.00                              | 4.30                     | 10.70                         | 3404.00              | 309.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 897.00                           | -0.00                              | 3.50                     | 10.90                         | 4721.00              | 150.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 953.00                           | -0.00                              | 3.20                     | 11.10                         | 1537.00              | 177.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1289.00                          | -0.00                              | 7.80                     | 8.80                          | 4282.00              | 262.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1356.00                          | -0.00                              | 4.70                     | 10.60                         | 2306.00              | 796.00              | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 8            | 1267.00                          | -0.00                              | 5.50                     | 10.10                         | 2086.00              | 564.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 408.51                             | 137.62                             | 0.0                                 | 2154.83                             | 1.01                               | 1.01                                | 6699.58                 | 2256.99                 | 0.0                      | 35339.13                 | 16.51                   | 16.51                    |
| 2            | 464.48                             | 77.32                              | 0.0                                 | 2232.33                             | 1.26                               | 1.26                                | 9243.11                 | 1538.61                 | 0.0                      | 44423.31                 | 25.01                   | 25.01                    |
| 3            | 566.28                             | 25.67                              | 0.0                                 | 2214.05                             | 6.68                               | 6.68                                | 12628.09                | 572.54                  | 0.0                      | 49373.27                 | 149.06                  | 149.06                   |
| 4            | 475.44                             | 36.73                              | 0.0                                 | 2326.45                             | 3.35                               | 3.35                                | 9461.29                 | 730.91                  | 0.0                      | 46296.39                 | 66.60                   | 66.60                    |
| 5            | 447.27                             | 12.30                              | 0.0                                 | 2437.72                             | 4.06                               | 4.06                                | 8900.73                 | 244.85                  | 0.0                      | 48510.62                 | 80.87                   | 80.87                    |
| 6            | 925.40                             | 29.10                              | 0.0                                 | 1640.42                             | 5.11                               | 5.11                                | 84581.13                | 2659.32                 | 0.0                      | 149933.94                | 466.66                  | 466.66                   |
| 7            | 611.38                             | 17.18                              | 0.0                                 | 2166.49                             | 17.01                              | 17.01                               | 36560.53                | 1027.35                 | 0.0                      | 129556.31                | 1017.06                 | 1017.06                  |
| 8            | 702.86                             | 15.27                              | 0.0                                 | 2028.00                             | 11.84                              | 11.84                               | 29660.84                | 644.29                  | 0.0                      | 85581.56                 | 499.60                  | 499.60                   |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 164 ENGINE TYPE AND MODEL: O-470-R SERIAL NUMBER: 203247-TORB  
 RATED HORSEPOWER: 230.  
 ENGINE TOTAL TIME: 182. HRS  
 FUEL: AV GAS 80/87 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 91.00  
 ATMOSPHERIC PRESSURE: START 29.95 FINISH 29.95  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 40.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00; FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

APPROACH MODE MISSING

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| TOLE-LOW    |                 | 1            | -0.0          | 10.60                          | 119.00                        | 0.07215           |
| TOLE/TAXI   |                 | 2            | -0.0          | 15.00                          | 184.00                        | 0.06879           |
| RUN UP      |                 | 3            | -0.0          | 35.50                          | 449.00                        | 0.06875           |
| RUN UP-LEAN |                 | 4            | -0.0          | 34.60                          | 441.00                        | 0.06498           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.60                          | 446.00                        | 0.06624           |
| TAKE-OFF    |                 | 6            | -0.0          | 106.60                         | 1240.00                       | 0.07406           |
| CLIMB       |                 | 7            | -0.0          | 101.00                         | 1330.00                       | 0.06864           |
| DESCENT     |                 | 8            | -0.0          | 52.50                          | 681.00                        | 0.06917           |
| DESCENT     | ON              | 8            | -0.0          | 60.30                          | 646.00                        | 0.07646           |
| TAXI        |                 | 10           | -0.0          | 11.50                          | 146.00                        | 0.06923           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 7.20                     | 7.40                          | 9395.00              | 10.00               | -0.00                    | -0.00                    | 30.00              | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 6.10                     | 8.60                          | 2009.00              | 41.00               | -0.00                    | -0.00                    | 11.00              | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 5.60                     | 9.20                          | 1359.00              | 122.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 5.10                     | 8.90                          | 1004.00              | 70.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | -0.00                               | -0.00                              | 5.00                     | 9.30                          | 1004.00              | 78.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 7.90                     | 7.90                          | 1832.00              | 150.00              | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 4.70                     | 10.20                         | 827.00               | 94.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 149.00                              | -0.00                              | 5.10                     | 9.90                          | 768.00               | 78.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 8            | 133.00                              | -0.00                              | 9.80                     | 6.40                          | 1773.00              | 22.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 10           | 128.00                              | -0.00                              | 5.50                     | 9.40                          | 1536.00              | 45.00               | -0.00                    | -0.00                    | 2.00               | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 936.05                             | 69.95                              | 0.0                                 | 1511.59                             | 0.21                               | 0.21                                | 9922.09                 | 741.50                  | 0.0                      | 16022.87                 | 2.26                    | 2.26                     |
| 2            | 827.03                             | 15.60                              | 0.0                                 | 1832.00                             | 0.91                               | 0.91                                | 12405.39                | 233.99                  | 0.0                      | 27480.02                 | 13.70                   | 13.70                    |
| 3            | 757.46                             | 10.53                              | 0.0                                 | 1955.22                             | 2.71                               | 2.71                                | 26889.74                | 373.73                  | 0.0                      | 69410.44                 | 96.22                   | 96.22                    |
| 4            | 730.70                             | 8.24                               | 0.0                                 | 2003.54                             | 1.65                               | 1.65                                | 25282.29                | 285.05                  | 0.0                      | 69322.56                 | 57.00                   | 57.00                    |
| 5            | 701.45                             | 8.07                               | 0.0                                 | 2049.97                             | 1.80                               | 1.80                                | 24270.18                | 279.11                  | 0.0                      | 70929.06                 | 62.19                   | 62.19                    |
| 6            | 998.54                             | 13.26                              | 0.0                                 | 1568.93                             | 3.11                               | 3.11                                | 106444.25               | 1413.73                 | 0.0                      | 167247.88                | 331.98                  | 331.98                   |
| 7            | 633.74                             | 6.39                               | 0.0                                 | 2160.98                             | 2.08                               | 2.08                                | 64007.48                | 645.04                  | 0.0                      | 218258.56                | 210.27                  | 210.27                   |
| 8            | 683.38                             | 5.89                               | 0.0                                 | 2084.33                             | 1.72                               | 1.72                                | 35877.48                | 309.43                  | 0.0                      | 109427.19                | 90.13                   | 90.13                    |
| 8            | 1208.89                            | 12.53                              | 0.0                                 | 1740.45                             | 0.45                               | 0.45                                | 72895.81                | 755.32                  | 0.0                      | 74798.88                 | 26.88                   | 26.88                    |
| 10           | 738.12                             | 11.81                              | 0.0                                 | 1982.11                             | 0.99                               | 0.99                                | 8488.32                 | 135.77                  | 0.0                      | 22794.23                 | 11.41                   | 11.41                    |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 165 ENGINE TYPE AND MODEL: O-470-R SERIAL NUMBER: 20347-70RC  
 RATED HORSEPOWER: 230.  
 ENGINE TOTAL TIME: 182. HRS  
 FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 91.00  
 ATMOSPHERIC PRESSURE: START 29.95 FINISH 29.95  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 40.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

TAKE OFF MODE MISSING

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 8.90                           | 101.00                        | 0.07439           |
| IDLE/TAXI   |                 | 2            | -0.0          | 14.10                          | 175.00                        | 0.07091           |
| RUN UP      |                 | 3            | -0.0          | 34.60                          | 446.00                        | 0.07118           |
| RUN UP-LEAN |                 | 4            | -0.0          | 34.60                          | 447.00                        | 0.07019           |
| RUN UP-RICH |                 | 5            | -0.0          | 34.60                          | 449.00                        | 0.07058           |
| CLIMB       |                 | 7            | -0.0          | 102.10                         | 1181.00                       | 0.07582           |
| DESCENT     |                 | 8            | -0.0          | 53.50                          | 689.00                        | 0.07057           |
| DESCENT     | ON              | 8            | -0.0          | 51.50                          | 545.00                        | 0.07903           |
| APPROACH    |                 | 9            | -0.0          | 35.50                          | 442.00                        | 0.06924           |
| TAXI        |                 | 10           | -0.0          | 12.40                          | 157.00                        | 0.06842           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 762.00                              | -0.00                              | 7.30                   | 7.90                          | 8569.00              | 13.00               | -0.00                    | -0.00                    | 29.00              | -0.00 | -0.00        |
| 2            | 942.00                              | -0.00                              | 6.10                   | 9.10                          | 1959.00              | 52.00               | -0.00                    | -0.00                    | 18.00              | -0.00 | -0.00        |
| 3            | 1323.00                             | -0.00                              | 5.40                   | 10.00                         | 1199.00              | 113.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1267.00                             | -0.00                              | 5.30                   | 9.90                          | 965.00               | 93.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1334.00                             | -0.00                              | 5.20                   | 10.10                         | 965.00               | 95.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1981.00                             | -0.00                              | 8.30                   | 7.90                          | 1609.00              | 26.00               | -0.00                    | -0.00                    | 8.00               | -0.00 | -0.00        |
| 8            | 1569.00                             | -0.00                              | 5.40                   | 9.90                          | 790.00               | 89.00               | -0.00                    | -0.00                    | 3.00               | -0.00 | -0.00        |
| 8            | 1457.00                             | -0.00                              | 10.30                  | 6.40                          | 2252.00              | 23.00               | -0.00                    | -0.00                    | 4.00               | -0.00 | -0.00        |
| 9            | 1278.00                             | -0.00                              | 6.00                   | 8.90                          | 1199.00              | 121.00              | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 10           | 1031.00                             | -0.00                              | 5.40                   | 9.30                          | 1726.00              | 53.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 918.47                             | 61.75                              | 0.0                                 | 1561.73                             | 0.27                               | 0.27                                | 8174.34                 | 549.55                  | 0.0                      | 13899.38                 | 2.39                    | 2.39                     |
| 2            | 800.44                             | 14.72                              | 0.0                                 | 1876.19                             | 1.12                               | 1.12                                | 11286.14                | 207.58                  | 0.0                      | 26454.24                 | 15.80                   | 15.80                    |
| 3            | 702.92                             | 8.94                               | 0.0                                 | 2045.27                             | 2.42                               | 2.42                                | 24321.06                | 309.28                  | 0.0                      | 70766.38                 | 83.60                   | 83.60                    |
| 4            | 699.98                             | 7.30                               | 0.0                                 | 2034.39                             | 2.02                               | 2.02                                | 24219.30                | 252.56                  | 0.0                      | 71081.94                 | 69.81                   | 69.81                    |
| 5            | 682.31                             | 7.25                               | 0.0                                 | 2082.28                             | 2.05                               | 2.05                                | 23607.98                | 250.92                  | 0.0                      | 72046.94                 | 70.84                   | 70.84                    |
| 7            | 1024.88                            | 11.38                              | 0.0                                 | 1532.71                             | 0.53                               | 0.53                                | 104640.13               | 1161.77                 | 0.0                      | 156489.63                | 53.84                   | 53.84                    |
| 8            | 709.36                             | 5.94                               | 0.0                                 | 2043.37                             | 1.92                               | 1.92                                | 37950.80                | 317.98                  | 0.0                      | 109320.31                | 102.74                  | 102.74                   |
| 8            | 1229.43                            | 15.40                              | 0.0                                 | 1200.29                             | 0.45                               | 0.45                                | 63315.86                | 792.85                  | 0.0                      | 61814.95                 | 23.22                   | 23.22                    |
| 9            | 807.02                             | 9.24                               | 0.0                                 | 1880.89                             | 2.67                               | 2.67                                | 28649.32                | 327.89                  | 0.0                      | 66771.50                 | 94.90                   | 94.90                    |
| 10           | 733.51                             | 13.43                              | 0.0                                 | 1984.89                             | 1.18                               | 1.18                                | 9095.58                 | 166.50                  | 0.0                      | 24612.61                 | 14.66                   | 14.66                    |

DATE: 8/17/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 391 ENGINE TYPE AND MODEL: D-470-R SERIAL NUMBER: 133510-6-AA  
 RATED HORSEPOWER: 230.  
 ENGINE TOTAL TIME: 69. HRS  
 FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.040

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.50 FINISH 83.50  
 ATMOSPHERIC PRESSURE: START 30.12 FINISH 30.12  
 INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01  
 RELATIVE HUMIDITY: 38.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 8

COMMENTS:

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | 12.40                          | 77.00                         | 0.08872           |
| IDLE/TAXI   |                 | 2            | -0.0          | 15.80                          | 164.00                        | 0.08667           |
| RUN UP      |                 | 3            | -0.0          | 30.90                          | 383.00                        | 0.07541           |
| RUN UP-LEAN |                 | 4            | -0.0          | 30.00                          | 402.00                        | 0.07031           |
| RUN UP-RICH |                 | 5            | -0.0          | 30.90                          | 408.00                        | 0.07088           |
| TAKE-OFF    |                 | 6            | -0.0          | 77.50                          | 1148.00                       | 0.06678           |
| CLIMB       |                 | 7            | -0.0          | 73.40                          | 10.93                         | 0.06497           |
| DESCENT     |                 | 8            | -0.0          | 41.10                          | 565.00                        | 0.07806           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 538.00                              | -0.00                              | 7.60                     | 3.70                          | 74911.00             | 3.00                | -0.00                    | -0.00                    | 36.00              | -0.00 | -0.00        |
| 2            | 897.00                              | -0.00                              | 9.90                     | 7.50                          | 12566.00             | 10.00               | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |
| 3            | 1256.00                             | -0.00                              | 6.20                     | 9.70                          | 5155.00              | 134.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1390.00                             | -0.00                              | 3.90                     | 11.30                         | 2255.00              | 80.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1345.00                             | -0.00                              | 4.30                     | 10.90                         | 3222.00              | 73.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1681.00                             | -0.00                              | 0.70                     | 14.00                         | 1442.00              | 3281.00             | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1704.00                             | -0.00                              | 0.50                     | 13.80                         | 1289.00              | 4206.00             | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 8            | 1592.00                             | -0.00                              | 3.60                     | 13.50                         | 1933.00              | 2681.00             | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 817.08                             | 461.25                             | 0.0                                 | 625.01                              | 0.05                               | 0.05                                | 10131.77                | 5719.55                 | 0.0                      | 7750.17                  | 0.66                    | 0.66                     |
| 2            | 1072.03                            | 77.93                              | 0.0                                 | 1276.05                             | 0.18                               | 0.18                                | 16937.99                | 1231.31                 | 0.0                      | 20161.65                 | 2.81                    | 2.81                     |
| 3            | 763.03                             | 36.33                              | 0.0                                 | 1875.68                             | 2.71                               | 2.71                                | 23577.50                | 1122.74                 | 0.0                      | 57958.34                 | 83.70                   | 83.70                    |
| 4            | 910.77                             | 16.91                              | 0.0                                 | 2325.30                             | 1.72                               | 1.72                                | 15323.16                | 507.43                  | 0.0                      | 69759.00                 | 51.63                   | 51.63                    |
| 5            | 559.65                             | 24.02                              | 0.0                                 | 2229.02                             | 1.56                               | 1.56                                | 17293.18                | 742.13                  | 0.0                      | 68876.56                 | 48.22                   | 48.22                    |
| 6            | 95.27                              | 11.24                              | 0.0                                 | 2993.72                             | 73.35                              | 73.35                               | 7383.20                 | 871.08                  | 0.0                      | 232013.38                | 5684.25                 | 5684.25                  |
| 7            | 70.01                              | 10.34                              | 0.0                                 | 3035.89                             | 96.73                              | 96.73                               | 5138.48                 | 758.69                  | 0.0                      | 222834.19                | 7099.93                 | 7099.93                  |
| 8            | 420.56                             | 12.93                              | 0.0                                 | 2477.97                             | 51.44                              | 51.44                               | 17284.94                | 531.55                  | 0.0                      | 101844.56                | 2114.38                 | 2114.38                  |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 268 ENGINE TYPE AND MODEL: 10-520-P SERIAL NUMBER: 110140-3-AA  
RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 1556. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 30.24 FINISH 30.24

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.07354           |
| IDLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.07797           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.07250           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.07178           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.07080           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.06335           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.06312           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.06586           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.06901           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.07952           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 549.00                              | -0.00                              | 7.00                     | 7.70                          | 11621.00             | 12.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 2            | 684.00                              | -0.00                              | 8.50                     | 7.10                          | 11621.00             | 15.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 3            | 1076.00                             | -0.00                              | 7.50                     | 7.90                          | 2480.00              | 47.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1043.00                             | -0.00                              | 6.90                     | 8.40                          | 2313.00              | 35.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1076.00                             | -0.00                              | 6.70                     | 8.40                          | 2202.00              | 32.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1469.00                             | -0.00                              | 2.60                     | 11.00                         | 2870.00              | 359.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1469.00                             | -0.00                              | 2.80                     | 10.90                         | 1310.00              | 213.00              | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 8            | 1390.00                             | -0.00                              | 4.40                     | 9.80                          | 1533.00              | -0.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1211.00                             | -0.00                              | 6.50                     | 8.20                          | 2202.00              | -0.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 740.00                              | -0.00                              | 8.30                     | 7.10                          | 16972.00             | -0.00               | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 269 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 110140-3-AB

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 1556. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 30.24 FINISH 30.24

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.07514           |
| IDLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.07659           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.07666           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.07591           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.07498           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.07352           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.07127           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.07339           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.07393           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.07718           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 381.00                              | -0.00                              | 6.80                     | 4.60                          | 45851.00             | -0.00               | -0.00                    | -0.00                    | 17.00              | -0.00 | -0.00        |
| 2            | 1435.00                             | -0.00                              | 7.20                     | 7.00                          | 22677.00             | -0.00               | -0.00                    | -0.00                    | 24.00              | -0.00 | -0.00        |
| 3            | 964.00                              | -0.00                              | 8.00                     | 8.30                          | 2731.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 942.00                              | -0.00                              | 7.40                     | 8.80                          | 2511.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 986.00                              | -0.00                              | 7.20                     | 8.80                          | 2511.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1390.00                             | -0.00                              | 3.70                     | 12.20                         | 2952.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1424.00                             | -0.00                              | 3.10                     | 12.50                         | 1241.00              | -0.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 8            | 1278.00                             | -0.00                              | 5.20                     | 10.70                         | 1517.00              | -0.00               | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1166.00                             | -0.00                              | 6.30                     | 9.60                          | 1848.00              | -0.00               | -0.00                    | -0.00                    | 5.00               | -0.00 | -0.00        |
| 10           | 773.00                              | -0.00                              | 8.30                     | 6.70                          | 15642.00             | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 270 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 110140-3AC

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: 1556. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.640

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 30.24 FINISH 30.24

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IOLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.05646           |
| IOLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.07501           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.07160           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.06958           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.07376           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.06777           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.06502           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.06629           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.06802           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.07531           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 594.00                              | -0.00                              | 4.20                     | 4.40                          | 34110.00             | 0.0                 | -0.00                    | -0.00                    | 39.00              | -0.00 | -0.00        |
| 2            | 796.00                              | -0.00                              | 6.10                     | 8.00                          | 21068.00             | 30.00               | -0.00                    | -0.00                    | 41.00              | -0.00 | -0.00        |
| 3            | 1099.00                             | -0.00                              | 6.50                     | 8.80                          | 2229.00              | 71.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1110.00                             | -0.00                              | 5.30                     | 9.70                          | 1505.00              | 108.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1054.00                             | -0.00                              | 6.20                     | 9.70                          | 1561.00              | 102.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1592.00                             | -0.00                              | 3.20                     | 11.40                         | 2787.00              | -0.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1592.00                             | -0.00                              | 2.40                     | 11.80                         | 1059.00              | 90.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 8            | 1446.00                             | -0.00                              | 4.60                     | 9.70                          | 1393.00              | 418.00              | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 9            | 1300.00                             | -0.00                              | 5.70                     | 8.90                          | 1561.00              | 256.00              | -0.00                    | -0.00                    | 14.00              | -0.00 | -0.00        |
| 10           | 942.00                              | -0.00                              | 7.70                     | 7.00                          | 14882.00             | 29.00               | -0.00                    | -0.00                    | 19.00              | -0.00 | -0.00        |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 262 ENGINE TYPE AND MODEL: IO-540-C405

SERIAL NUMBER: L-901-48A

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1318. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.90 FINISH 29.90

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.08567           |
| IDLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.08431           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.07898           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.07856           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.07827           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.09348           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.09578           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.09134           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.08322           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.08587           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 628.00                              | -0.00                              | 8.50                     | 4.50                          | 52045.00             | 0.0                 | -0.00                    | -0.00                    | 63.00              | -0.00 | -0.00        |
| 2            | 740.00                              | -0.00                              | 9.70                     | 6.40                          | 19599.00             | 0.0                 | -0.00                    | -0.00                    | 46.00              | -0.00 | -0.00        |
| 3            | 1222.00                             | -0.00                              | 9.30                     | 7.40                          | 2965.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1143.00                             | -0.00                              | 9.20                     | 7.40                          | 3074.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1233.00                             | -0.00                              | 9.10                     | 7.50                          | 2525.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1300.00                             | -0.00                              | 12.90                    | 6.80                          | 3349.00              | 0.0                 | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1256.00                             | -0.00                              | 12.60                    | 7.70                          | 3129.00              | 0.0                 | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 8            | 1256.00                             | -0.00                              | 12.10                    | 7.20                          | 3184.00              | 0.0                 | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 9            | 1143.00                             | -0.00                              | 9.90                     | 7.70                          | 3294.00              | 0.0                 | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 673.00                              | -0.00                              | 8.40                     | 4.80                          | 50728.00             | 0.0                 | -0.00                    | -0.00                    | 33.00              | -0.00 | -0.00        |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 263 ENGINE TYPE AND MODEL: IO-540-C485 SERIAL NUMBER: L-901-488  
RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1316. HRS

FUEL: AV GAS 100/130 FUEL M/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 29.90 FINISH 29.90

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 41.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00; FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.08317           |
| IDLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.08091           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.07432           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.07232           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.07504           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.08789           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.08119           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.08823           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.08432           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.08305           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 516.00                              | -0.00                              | 6.40                     | 4.50                          | 67866.00             | 28.00               | -0.00                    | -0.00                    | 59.00              | -0.00 | -0.00        |
| 2            | 650.00                              | -0.00                              | 7.50                     | 5.40                          | 43699.00             | 43.00               | -0.00                    | -0.00                    | 67.00              | -0.00 | -0.00        |
| 3            | 1166.00                             | -0.00                              | 7.90                     | 7.80                          | 3752.00              | 115.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1177.00                             | -0.00                              | 7.40                     | 7.90                          | 3531.00              | 87.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1233.00                             | -0.00                              | 8.00                     | 7.90                          | 2924.00              | 71.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1323.00                             | -0.00                              | 11.80                    | 6.70                          | 3366.00              | 131.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1289.00                             | -0.00                              | 10.30                    | 6.80                          | 3200.00              | 45.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 8            | 1267.00                             | -0.00                              | 10.90                    | 7.80                          | 3090.00              | 51.00               | -0.00                    | -0.00                    | 21.00              | -0.00 | -0.00        |
| 9            | 1166.00                             | -0.00                              | 9.50                     | 8.40                          | 3255.00              | 78.00               | -0.00                    | -0.00                    | 6.00               | -0.00 | -0.00        |
| 10           | 740.00                              | -0.00                              | 9.30                     | 5.40                          | 30126.00             | 75.00               | -0.00                    | -0.00                    | 27.00              | -0.00 | -0.00        |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 264 ENGINE TYPE AND MODEL: 10-540-C4B5 SERIAL NUMBER: L-901-48C

RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1319. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 29.90 FINISH 29.90

INLET AIR HUMIDITY, GRM H2O/LB AIR: 0.02

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HFATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.08588           |
| IDLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.08220           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.07613           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.07585           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.07568           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.09024           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.09657           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.09267           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.08541           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.09229           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGR F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|----------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 538.00                           | -0.00                              | 7.50                     | 5.20                          | 56141.00             | 19.00               | -0.00                    | -0.00                    | 84.00              | -0.00 | -0.00        |
| 2            | 661.00                           | -0.00                              | 7.90                     | 6.50                          | 32278.00             | 40.00               | -0.00                    | -0.00                    | 62.00              | -0.00 | -0.00        |
| 3            | 1166.00                          | -0.00                              | 7.90                     | 8.20                          | 3504.00              | 140.00              | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1188.00                          | -0.00                              | 7.70                     | 8.40                          | 3062.00              | 98.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1233.00                          | -0.00                              | 7.80                     | 8.30                          | 2621.00              | 98.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1289.00                          | -0.00                              | 12.10                    | 6.90                          | 3559.00              | 55.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1289.00                          | -0.00                              | 12.30                    | 8.20                          | 3338.00              | 55.00               | -0.00                    | -0.00                    | 15.00              | -0.00 | -0.00        |
| 8            | 1267.00                          | -0.00                              | 11.30                    | 8.40                          | 3173.00              | 67.00               | -0.00                    | -0.00                    | 10.00              | -0.00 | -0.00        |
| 9            | 1166.00                          | -0.00                              | 9.40                     | 8.80                          | 2952.00              | 105.00              | -0.00                    | -0.00                    | 9.00               | -0.00 | -0.00        |
| 10           | 695.00                           | -0.00                              | 9.50                     | 5.00                          | 51479.00             | 35.00               | -0.00                    | -0.00                    | 32.00              | -0.00 | -0.00        |

DATE: 8/ 6/71

TEST ORGANIZATION: SCOTT/GEN AVIATION

ENGINE SUPPLIER: LYCOMING

ENGINE DATA .....

CAL ID NUMBER: 265 ENGINE TYPE AND MODEL: IO-540-C4B5 SERIAL NUMBER: L-1623-48A  
RATED HORSEPOWER: 250.

ENGINE TOTAL TIME: 1304. HRS

FUEL: FUEL W/C RATIO: 0.251

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 29.90 FINISH 29.90

INLET AIR HUMIDITY, GRN H2O/LB AIR: 0.01

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 7.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.60

NUMBER OF TESTS: 10

COMMENTS:

NO FUEL FLOW DATA

|             | CARB.<br>HEATER | TEST<br>MODE | ENGINE<br>RPM | MEASURED<br>FUEL FLOW<br>LB/HR | MEASURED<br>AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|-------------|-----------------|--------------|---------------|--------------------------------|-------------------------------|-------------------|
| IDLE-LOW    |                 | 1            | -0.0          | -0.00                          | -0.00                         | 0.08279           |
| IDLE/TAXI   |                 | 2            | -0.0          | -0.00                          | -0.00                         | 0.07913           |
| RUN UP      |                 | 3            | -0.0          | -0.00                          | -0.00                         | 0.08267           |
| RUN UP-LEAN |                 | 4            | -0.0          | -0.00                          | -0.00                         | 0.08039           |
| RUN UP-RICH |                 | 5            | -0.0          | -0.00                          | -0.00                         | 0.08258           |
| TAKE-OFF    |                 | 6            | -0.0          | -0.00                          | -0.00                         | 0.12776           |
| CLIMB       |                 | 7            | -0.0          | -0.00                          | -0.00                         | 0.10178           |
| DESCENT     |                 | 8            | -0.0          | -0.00                          | -0.00                         | 0.09987           |
| APPROACH    |                 | 9            | -0.0          | -0.00                          | -0.00                         | 0.09340           |
| TAXI        |                 | 10           | -0.0          | -0.00                          | -0.00                         | 0.07826           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PERCENT V | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES<br>(DRY) | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|--------------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|--------------------|-------|--------------|
| 1            | 78.00                               | -0.00                              | 9.20                     | 4.80                          | 48245.00             | 5.00                | -0.00                    | -0.00                    | 76.00              | -0.00 | -0.00        |
| 2            | 830.00                              | -0.00                              | 9.60                     | 6.70                          | 16803.00             | 16.00               | -0.00                    | -0.00                    | 47.00              | -0.00 | -0.00        |
| 3            | 1211.00                             | -0.00                              | 12.40                    | 5.60                          | 5324.00              | 18.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 4            | 1256.00                             | -0.00                              | 10.50                    | 5.50                          | 21794.00             | 19.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 5            | 1300.00                             | -0.00                              | 12.20                    | 5.80                          | 5324.00              | 11.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 6            | 1334.00                             | -0.00                              | 19.30                    | 8.00                          | 4769.00              | 11.00               | -0.00                    | -0.00                    | -0.00              | -0.00 | -0.00        |
| 7            | 1278.00                             | -0.00                              | 15.20                    | 6.90                          | 4436.00              | 10.00               | -0.00                    | -0.00                    | 16.00              | -0.00 | -0.00        |
| 8            | 1278.00                             | -0.00                              | 14.90                    | 6.80                          | 4492.00              | 11.00               | -0.00                    | -0.00                    | 13.00              | -0.00 | -0.00        |
| 9            | 1177.00                             | -0.00                              | 13.80                    | 6.50                          | 5157.00              | 11.00               | -0.00                    | -0.00                    | 12.00              | -0.00 | -0.00        |
| 10           | 773.00                              | -0.00                              | 9.20                     | 4.80                          | 37931.00             | 14.00               | -0.00                    | -0.00                    | 40.00              | -0.00 | -0.00        |

## **TABLE II**

### **LIGHT-UTILITY PISTON ENGINES**

#### **TELEDYNE/CONTINENTAL**

##### **CONTENTS:**

|                       |                                                                            |
|-----------------------|----------------------------------------------------------------------------|
| <b>II-2 TO II-20</b>  | <b>INDIVIDUAL ENGINE RUNS – COMPLETELY PROCESSED –<br/>CLIMB LEAN MODE</b> |
| <b>II-21</b>          | <b>MODEL SUMMARY – CLIMB LEAN MODE</b>                                     |
| <b>II-22 TO II-34</b> | <b>INDIVIDUAL ENGINE RUNS – CLIMB RICH MODE</b>                            |
| <b>II-35</b>          | <b>MODEL SUMMARY – CLIMB RICH MODE</b>                                     |
| <b>II-36</b>          | <b>INDIVIDUAL RUN – MASS EMISSION CONVERSION ONLY</b>                      |

DATE: 6/18/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 201 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 213457A

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.91 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 73.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TFST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 4.00                              | 27.00             | 0.14815           |
| TAXI-IDLE LOW        | 2            | 2.60        | 2                         | 5.40                              | 45.00             | 0.12000           |
| TAXI-IDLE HIGH       | 3            | 6.50        | 6                         | 8.20                              | 72.00             | 0.11389           |
| RUN-UP               | 4            | 20.40       | 20                        | 13.80                             | 153.00            | 0.09020           |
| TAKE-OFF 100%        | 6            | 89.40       | 89                        | 53.00                             | 558.00            | 0.09498           |
| CLIMB-LEAN           | 9            | 88.80       | 88                        | 51.00                             | 558.00            | 0.09140           |
| APPROACH             | 10           | 30.00       | 29                        | 23.00                             | 216.00            | 0.10648           |
| TAXI-IDLE            | 11           | 7.20        | 7                         | 9.00                              | 72.00             | 0.12500           |
| HOT START            | 13           | 0.0         | 0                         | 4.00                              | 27.00             | 0.14815           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 62000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 63000.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 102000.00           | -0.00                         | -0.00                | 59.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | -0.00                | 59.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 54500.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 97500.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 97500.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HK | MASS EMI<br>HC<br>LB/HK | MASS EMI<br>NO2<br>LB/HK | MASS EMI<br>CO2<br>LB/HK | MASS EMI<br>NO<br>LB/HK | MASS EMI<br>NOX<br>LB/HK |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 342.80                             | -0.00                              | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 1.53                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 495.50                             | -0.00                              | -0.00                               | -0.00                               | 0.33                               | -0.00                               | 2.68                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 579.55                             | -0.00                              | -0.00                               | -0.00                               | 0.41                               | -0.00                               | 4.75                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 4            | 768.79                             | -0.00                              | -0.00                               | -0.00                               | 0.60                               | -0.00                               | 10.61                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 6            | 1012.19                            | -0.00                              | -0.00                               | -0.00                               | 0.96                               | -0.00                               | 53.65                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 9            | 1001.18                            | -0.00                              | -0.00                               | -0.00                               | 1.00                               | -0.00                               | 51.65                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 10           | 487.44                             | -0.00                              | -0.00                               | -0.00                               | 0.37                               | -0.00                               | 11.21                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 11           | 749.14                             | -0.00                              | -0.00                               | -0.00                               | 0.32                               | -0.00                               | 6.74                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 632.60                             | -0.00                              | -0.00                               | -0.00                               | 0.37                               | -0.00                               | 7.53                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/LK HP-HR | CO<br>2<br>LB/LK HP-HR | THC<br>LB/LK HP-HR | NO<br>LB/LK HP-HR | NO<br>2<br>LB/LK HP-HR | NO<br>X<br>LB/LK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 1.029             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 3                                            | 0.731             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 4                                            | 0.520             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 6                                            | 0.600             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 9                                            | 0.575             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 10                                           | 0.374             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 11                                           | 0.936             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/LK<br>LB FUEL | CO<br>LB/LK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/LK<br>LB FUEL | HC<br>LB/LK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/LK<br>LB FUEL | NO<br>LB/LK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 4                       | 12.00                   | 8.20                           | 1.64                 | 579.55                 | 4752.28              | 0.950                  | -0.00                  | -0.00                | -0.000                 | 0.41                   | 3.39                 | 0.0007                 |
| 6                       | 0.30                    | 53.00                          | 0.26                 | 1012.19                | 51645.95             | 0.268                  | -0.00                  | -0.00                | -0.000                 | 0.96                   | 50.97                | 0.0003                 |
| 9                       | 5.00                    | 51.00                          | 4.23                 | 1001.18                | 51060.03             | 4.234                  | -0.00                  | -0.00                | -0.000                 | 1.00                   | 50.75                | 0.0042                 |
| 10                      | 6.00                    | 23.00                          | 2.30                 | 487.44                 | 11211.21             | 1.121                  | -0.00                  | -0.00                | -0.000                 | 0.37                   | 8.45                 | 0.0008                 |
| 11                      | 4.00                    | 9.00                           | 0.60                 | 749.14                 | 6742.24              | 0.452                  | -0.00                  | -0.00                | -0.000                 | 0.32                   | 2.64                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 9.041                |                        |                      | 7.030                  |                        |                      | -0.000                 |                        |                      | 0.0062                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.778                  |                        |                      | -0.000                 |                        |                      | 0.0007                 |

DATE: 6/18/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 202 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 213457B

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.92 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 79.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 4.00                              | 27.00             | 0.14815           |
| TAXI-IDLE LOW        | 2            | 2.10        | 2                         | 5.30                              | 45.00             | 0.11778           |
| TAXI-IDLE HIGH       | 3            | 7.00        | 6                         | 6.30                              | 72.00             | 0.08750           |
| RUN-UP               | 4            | 20.10       | 20                        | 15.00                             | 162.00            | 0.09259           |
| TAKE-OFF 100Y        | 6            | 89.60       | 89                        | 52.00                             | 558.00            | 0.09319           |
| CLIMB-RICH           | 8            | 88.30       | 88                        | 50.00                             | 558.00            | 0.08961           |
| CLIMB-LEAN           | 9            | 87.50       | 87                        | 50.00                             | 558.00            | 0.08961           |
| APPROACH             | 10           | 28.00       | 27                        | 23.00                             | 207.00            | 0.11111           |
| TAXI-IDLE            | 11           | 9.30        | 9                         | 10.00                             | 63.00             | 0.15873           |
| HOT START            | 13           | 0.0         | 0                         | 4.00                              | 18.00             | 0.22222           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | -0.00                | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | -0.00                | 20.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 95000.00            | -0.00                         | -0.00                | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 95000.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 95000.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 344.86                             | -0.00                              | -0.00                               | -0.00                               | 0.27                               | -0.00                               | 1.40                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 438.72                             | -0.00                              | -0.00                               | -0.00                               | 0.13                               | -0.00                               | 2.33                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 681.86                             | -0.00                              | -0.00                               | -0.00                               | 0.17                               | -0.00                               | 4.30                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 4            | 790.68                             | -0.00                              | -0.00                               | -0.00                               | 0.33                               | -0.00                               | 11.80                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 6            | 957.53                             | -0.00                              | -0.00                               | -0.00                               | 0.99                               | -0.00                               | 49.79                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 8            | 991.29                             | -0.00                              | -0.00                               | -0.00                               | 0.94                               | -0.00                               | 49.56                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 9            | 991.29                             | -0.00                              | -0.00                               | -0.00                               | 0.94                               | -0.00                               | 49.56                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 10           | 454.94                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 10.44                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 11           | 416.32                             | -0.00                              | -0.00                               | -0.00                               | 0.25                               | -0.00                               | 4.10                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 224.83                             | -0.00                              | -0.00                               | -0.00                               | 0.27                               | -0.00                               | 0.97                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 1.107             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 3                                            | 0.614             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 4                                            | 0.599             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 6                                            | 0.556             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 8                                            | 0.561             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 9                                            | 0.566             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 10                                           | 0.374             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 11                                           | 0.448             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 6.30                           | 1.26                 | 681.86                 | 4295.69              | 0.859                  | -0.00                  | -0.00                | -0.000                 | 0.17                   | 1.10                 | 0.0002                 |
| 6                       | 0.30                    | 52.00                          | 0.26                 | 957.53                 | 49791.52             | 0.249                  | -0.00                  | -0.00                | -0.000                 | 0.94                   | 51.65                | 0.0003                 |
| 9                       | 5.00                    | 50.00                          | 4.15                 | 991.29                 | 49586.45             | 4.114                  | -0.00                  | -0.00                | -0.000                 | 0.94                   | 47.13                | 0.0039                 |
| 10                      | 6.00                    | 23.00                          | 2.30                 | 454.98                 | 10464.45             | 1.046                  | -0.00                  | -0.00                | -0.000                 | 0.15                   | 8.11                 | 0.0008                 |
| 11                      | 4.00                    | 10.00                          | 0.67                 | 416.32                 | 1665.23              | 0.279                  | -0.00                  | -0.00                | -0.000                 | 0.25                   | 2.48                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 8.640                |                        |                      | 6.547                  |                        |                      | -0.000                 |                        |                      | 0.0054                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.753                  |                        |                      | -0.000                 |                        |                      | 0.0006                 |

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 203 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 213904A

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.91 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |
| TAXI-IDLE LOW        | 2            | 2.80        | 2                         | 4.60                              | 40.50             | 0.11358           |
| TAXI-IDLE HIGH       | 3            | 8.00        | 7                         | 8.20                              | 76.50             | 0.10719           |
| RUN-UP               | 4            | 20.30       | 20                        | 15.50                             | 157.50            | 0.09841           |
| TAKE-OFF 100%        | 6            | 91.30       | 91                        | 53.00                             | 576.00            | 0.09201           |
| CLIMB-LFAN           | 9            | 91.10       | 91                        | 51.00                             | 567.00            | 0.08995           |
| APPROACH             | 10           | 29.30       | 29                        | 22.00                             | 207.00            | 0.10628           |
| TAXI-IDLE            | 11           | 7.40        | 7                         | 7.50                              | 67.50             | 0.11111           |
| HOT START            | 13           | 0.0         | 0                         | 3.50                              | 22.50             | 0.15556           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPHV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPHV | NO<br>(DRY)<br>PPHV | NO<br>2<br>(DRY)<br>PPHV | NO<br>X<br>(DRY)<br>PPHV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 50000.00            | -0.00                         | 25000.00             | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | 27500.00             | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 73500.00            | -0.00                         | 17500.00             | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 87500.00            | -0.00                         | 4000.00              | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 93000.00            | -0.00                         | -0.00                | 115.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 87500.00            | -0.00                         | -0.00                | 150.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 371.66                             | 138.64                             | -0.00                               | -0.00                               | 0.31                               | -0.00                               | 1.30                    | 0.49                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 540.20                             | 167.84                             | -0.00                               | -0.00                               | 0.14                               | -0.00                               | 2.48                    | 0.77                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 654.89                             | 111.36                             | -0.00                               | -0.00                               | 0.51                               | -0.00                               | 5.37                    | 0.91                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 4            | 843.01                             | 27.06                              | -0.00                               | -0.00                               | 0.55                               | -0.00                               | 13.07                   | 0.42                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 6            | 951.52                             | -0.00                              | -0.00                               | -0.00                               | 1.93                               | -0.00                               | 50.43                   | -0.00                   | -0.00                    | -0.00                    | 0.10                    | -0.00                    |
| 9            | 913.37                             | -0.00                              | -0.00                               | -0.00                               | 2.57                               | -0.00                               | 46.58                   | -0.00                   | -0.00                    | -0.00                    | 0.13                    | -0.00                    |
| 10           | 619.66                             | -0.00                              | -0.00                               | -0.00                               | 0.37                               | -0.00                               | 13.61                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 11           | 465.30                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 3.49                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 334.01                             | -0.00                              | -0.00                               | -0.00                               | 0.41                               | -0.00                               | 1.17                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HK BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 0.887             | -0.000                 | 0.276              | 0.000             | -0.000                 | 0.000                  |
| 3                                           | 0.671             | -0.000                 | 0.114              | 0.001             | -0.000                 | 0.001                  |
| 4                                           | 0.644             | -0.000                 | 0.021              | 0.000             | -0.000                 | 0.000                  |
| 6                                           | 0.552             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 9                                           | 0.511             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 10                                          | 0.465             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 11                                          | 0.472             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 8.20                           | 1.64                 | 654.89                 | 5370.07              | 1.074                  | 111.36                 | 913.12               | 0.183                  | 0.51                   | 4.20                 | 0.0008                 |
| 6                       | 0.30                    | 53.00                          | 0.26                 | 951.52                 | 50430.65             | 0.252                  | -0.00                  | -0.00                | -0.000                 | 1.93                   | 102.43               | 0.0005                 |
| 9                       | 5.00                    | 51.00                          | 4.23                 | 913.37                 | 46581.89             | 3.866                  | -0.00                  | -0.00                | -0.000                 | 2.57                   | 131.17               | 0.0109                 |
| 10                      | 6.00                    | 22.00                          | 2.20                 | 619.66                 | 13632.48             | 1.363                  | -0.00                  | -0.00                | -0.000                 | 0.17                   | 8.11                 | 0.0008                 |
| 11                      | 4.00                    | 7.50                           | 0.50                 | 465.30                 | 3489.76              | 0.234                  | -0.00                  | -0.00                | -0.000                 | 0.35                   | 2.65                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                |                      | 8.840                  |                      | 6.790                  |                        |                      | -0.000                 |                        |                      | 0.0132                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.768                  |                        |                      | -0.000                 |                        |                      | 0.0015                 |

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 204 ENGINE TYPE AND MODEL: O-200-A SERIAL NUMBER: 2135048

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.91 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 65.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |
| TAXI-IDLE LOW        | 2            | 2.00        | 1                         | 4.30                              | 36.00             | 0.11944           |
| TAXI-IDLE HIGH       | 3            | 6.80        | 6                         | 7.60                              | 67.50             | 0.11259           |
| RUN-UP               | 4            | 19.60       | 19                        | 13.20                             | 153.00            | 0.08627           |
| TAKE-OFF 100%        | 6            | 91.10       | 91                        | 53.00                             | 571.50            | 0.09274           |
| CLIMB-RICH           | 8            | 91.10       | 91                        | 53.00                             | 571.50            | 0.09274           |
| CLIMB-LEAN           | 9            | 90.30       | 90                        | 51.00                             | 567.00            | 0.08995           |
| APPROACH             | 10           | 28.80       | 28                        | 22.00                             | 207.50            | 0.10864           |
| TAXI-IDLE            | 11           | 7.00        | 6                         | 6.50                              | 67.50             | 0.09630           |
| HOT START            | 13           | 0.0         | 0                         | 3.50                              | 22.50             | 0.15556           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 82500.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | -0.00                | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 53500.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 6000.00             | -0.00                         | -0.00                | 130.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | -0.00                | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | -0.00                | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 130.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 85000.00            | -0.00                         | -0.00                | 20.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 49500.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 79000.00            | -0.00                         | -0.00                | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 612.95                             | -0.00                              | -0.00                               | -0.00                               | 0.31                               | -0.00                               | 2.15                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 595.16                             | -0.00                              | -0.00                               | -0.00                               | 0.13                               | -0.00                               | 2.56                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 455.08                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 3.46                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 4            | 64.97                              | -0.00                              | -0.00                               | -0.00                               | 2.31                               | -0.00                               | 0.86                    | -0.00                   | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 6            | 649.97                             | -0.00                              | -0.00                               | -0.00                               | 1.50                               | -0.00                               | 34.45                   | -0.00                   | -0.00                    | -0.00                    | 0.08                    | -0.00                    |
| 8            | 649.97                             | -0.00                              | -0.00                               | -0.00                               | 1.50                               | -0.00                               | 34.45                   | -0.00                   | -0.00                    | -0.00                    | 0.08                    | -0.00                    |
| 9            | 563.42                             | -0.00                              | -0.00                               | -0.00                               | 2.23                               | -0.00                               | 28.73                   | -0.00                   | -0.00                    | -0.00                    | 0.11                    | -0.00                    |
| 10           | 747.60                             | -0.00                              | -0.00                               | -0.00                               | 0.29                               | -0.00                               | 16.45                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 11           | 486.10                             | -0.00                              | -0.00                               | -0.00                               | 0.44                               | -0.00                               | 3.16                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 482.23                             | -0.00                              | -0.00                               | -0.00                               | 0.41                               | -0.00                               | 1.69                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 1.290             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 3                                            | 0.509             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 4                                            | 0.044             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 6                                            | 0.378             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 8                                            | 0.378             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 9                                            | 0.318             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 10                                           | 0.571             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 11                                           | 0.451             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

#### LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 1                       | 12.00                   | 7.60                           | 1.52                 | 455.08                 | 3459.64              | 0.692                  | -0.00                  | -0.00                | -0.000                 | 0.35                   | 2.65                 | 0.0005                 |
| 6                       | 0.30                    | 53.00                          | 0.76                 | 649.97                 | 34448.53             | 0.172                  | -0.00                  | -0.00                | -0.000                 | 1.50                   | 74.57                | 0.0004                 |
| 7                       | 5.00                    | 51.00                          | 4.23                 | 563.42                 | 28734.33             | 2.185                  | -0.00                  | -0.00                | -0.000                 | 2.23                   | 113.62               | 0.0094                 |
| 10                      | 6.00                    | 22.00                          | 2.20                 | 747.60                 | 16447.10             | 1.645                  | -0.00                  | -0.00                | -0.000                 | 0.29                   | 6.36                 | 0.0006                 |
| 11                      | 4.00                    | 6.50                           | 0.44                 | 486.10                 | 3159.68              | 0.212                  | -0.00                  | -0.00                | -0.000                 | 0.48                   | 3.15                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 8.653                |                        |                      | 5.105                  |                        |                      | -0.000                 |                        |                      | 0.0112                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.590                  |                        |                      | -0.000                 |                        |                      | 0.0013                 |

DATE: 6/22/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 205 ENGINE TYPE AND MODEL: D-200-A SERIAL NUMBER: 213403

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.93 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 64.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 22.50             | 0.15556           |
| TAXI-IDLE LOW        | 2            | 2.70        | 2                         | 4.00                              | 45.00             | 0.08889           |
| TAXI-IDLE HIGH       | 3            | 7.50        | 7                         | 7.50                              | 81.00             | 0.09259           |
| RUN-UP               | 4            | 20.90       | 20                        | 12.60                             | 171.00            | 0.07368           |
| TAKE-OFF 100%        | 6            | 93.30       | 93                        | 52.00                             | 576.00            | 0.09028           |
| CLIMB-LEAN           | 9            | 92.10       | 92                        | 51.00                             | 567.00            | 0.08995           |
| APPROACH             | 10           | 29.00       | 28                        | 21.50                             | 207.00            | 0.10386           |
| TAXI-IDLE            | 11           | 7.10        | 7                         | 6.30                              | 63.00             | 0.10000           |
| HOT START            | 13           | 0.0         | 0                         | 3.50                              | 22.50             | 0.15556           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 10000.00            | -0.00                         | 20000.00             | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 4000.00              | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | 3100.00              | 70.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 5000.00             | -0.00                         | 500.00               | 445.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 88000.00            | -0.00                         | 1250.00              | 225.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 2250.00              | 260.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 1500.00              | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 3000.00              | 65.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 25000.00             | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 61.84                              | 97.10                              | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 0.22                    | 0.34                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 648.52                             | 29.08                              | -0.00                               | -0.00                               | 0.73                               | -0.00                               | 2.59                    | 0.12                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 600.17                             | 21.90                              | -0.00                               | -0.00                               | 1.17                               | -0.00                               | 4.50                    | 0.16                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 61.85                              | 4.14                               | -0.00                               | -0.00                               | 9.04                               | -0.00                               | 0.78                    | 0.05                    | -0.00                    | -0.00                    | 0.11                    | -0.00                    |
| 6            | 915.42                             | 8.99                               | -0.00                               | -0.00                               | 3.84                               | -0.00                               | 47.60                   | 0.47                    | -0.00                    | -0.00                    | 0.20                    | -0.00                    |
| 9            | 897.50                             | 16.22                              | -0.00                               | -0.00                               | 4.46                               | -0.00                               | 45.77                   | 0.83                    | -0.00                    | -0.00                    | 0.23                    | -0.00                    |
| 10           | 486.04                             | 9.76                               | -0.00                               | -0.00                               | 0.60                               | -0.00                               | 10.45                   | 0.21                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 11           | 583.86                             | 20.06                              | -0.00                               | -0.00                               | 1.01                               | -0.00                               | 3.68                    | 0.13                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 457.61                             | 121.37                             | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 1.60                    | 0.42                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 0.961             | -0.000                 | 0.043              | 0.001             | -0.000                 | 0.001                  |
| 3                                           | 0.600             | -0.000                 | 0.022              | 0.001             | -0.000                 | 0.001                  |
| 4                                           | 0.037             | -0.000                 | 0.002              | 0.005             | -0.000                 | 0.005                  |
| 6                                           | 0.510             | -0.000                 | 0.005              | 0.002             | -0.000                 | 0.002                  |
| 9                                           | 0.497             | -0.000                 | 0.009              | 0.002             | -0.000                 | 0.002                  |
| 10                                          | 0.360             | -0.000                 | 0.007              | 0.000             | -0.000                 | 0.000                  |
| 11                                          | 0.518             | -0.000                 | 0.018              | 0.001             | -0.000                 | 0.001                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

#### LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 7.50                           | 1.50                 | 600.17                 | 4501.27              | 0.900                  | 21.90                  | 164.23               | 0.033                  | 1.17                   | 8.77                 | 0.0018                 |
| 6                       | 0.30                    | 52.00                          | 0.26                 | 915.42                 | 47601.64             | 0.238                  | 8.99                   | 467.43               | 0.002                  | 3.84                   | 199.91               | 0.0010                 |
| 9                       | 5.00                    | 51.00                          | 4.23                 | 897.50                 | 45772.69             | 3.799                  | 16.22                  | 827.34               | 0.064                  | 4.46                   | 227.30               | 0.0189                 |
| 10                      | 6.00                    | 21.50                          | 2.15                 | 486.04                 | 10449.95             | 1.045                  | 9.76                   | 209.91               | 0.021                  | 0.60                   | 12.95                | 0.0013                 |
| 11                      | 4.00                    | 6.30                           | 0.42                 | 583.86                 | 3678.31              | 0.246                  | 20.06                  | 126.40               | 0.008                  | 1.01                   | 6.39                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                |                      | 8.565                  |                      | 6.229                  |                        |                      | 0.133                  |                        |                      | 0.0233                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.727                  |                        |                      | 0.016                  |                        |                      | 0.0027                 |

DATE: 6/23/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 2D6 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 213500A

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.71 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 83.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 22.50             | 0.15556           |
| TAXI-IDLE LOW        | 2            | 2.10        | 2                         | 4.00                              | 45.00             | 0.08889           |
| TAXI-IDLE HIGH       | 3            | 6.60        | 6                         | 10.50                             | 81.00             | 0.12963           |
| RUN-UP               | 4            | 18.60       | 18                        | 15.70                             | 153.00            | 0.10261           |
| TAKE-OFF 100%        | 6            | 89.10       | 89                        | 51.50                             | 562.50            | 0.09156           |
| CLIMB-LFAN           | 9            | 88.80       | 88                        | 51.00                             | 558.00            | 0.09140           |
| APPROACH             | 10           | 28.10       | 28                        | 21.50                             | 207.00            | 0.10386           |
| TAXI-IDLE            | 11           | 6.60        | 6                         | 11.80                             | 67.50             | 0.17481           |
| HOT START            | 13           | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDPHYOES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 35000.00            | -0.00                         | 32500.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | 35000.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 70000.00             | 45.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 15500.00             | 85.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 82500.00            | -0.00                         | 21000.00             | 175.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 17500.00             | 195.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 9000.00              | 70.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 112000.00           | -0.00                         | 7500.00              | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 35000.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 215.46                             | 157.78                             | -0.00                               | -0.00                               | 0.56                               | -0.00                               | 0.75                    | 0.55                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 671.91                             | 25.45                              | -0.00                               | -0.00                               | 1.03                               | -0.00                               | 2.69                    | 0.10                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 721.32                             | 38.82                              | -0.00                               | -0.00                               | 0.55                               | -0.00                               | 7.57                    | 0.41                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 567.77                             | 10.18                              | -0.00                               | -0.00                               | 1.29                               | -0.00                               | 8.91                    | 0.16                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 6            | 941.90                             | 14.95                              | -0.00                               | -0.00                               | 2.94                               | -0.00                               | 43.46                   | 0.77                    | -0.00                    | -0.00                    | 0.15                    | -0.00                    |
| 9            | 881.04                             | 12.48                              | -0.00                               | -0.00                               | 3.28                               | -0.00                               | 44.93                   | 0.64                    | -0.00                    | -0.00                    | 0.17                    | -0.00                    |
| 10           | 474.76                             | 5.86                               | -0.00                               | -0.00                               | 1.05                               | -0.00                               | 10.21                   | 0.13                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 11           | 609.52                             | 3.34                               | -0.00                               | -0.00                               | 0.31                               | -0.00                               | 7.19                    | 0.04                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 394.50                             | 194.09                             | -0.00                               | -0.00                               | 0.73                               | -0.00                               | 1.40                    | 0.68                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 1.280             | -0.000                 | 0.044              | 0.002             | -0.000                 | 0.002                  |
| 3                                            | 1.148             | -0.000                 | 0.062              | 0.001             | -0.000                 | 0.001                  |
| 4                                            | 0.479             | -0.000                 | 0.009              | 0.001             | -0.000                 | 0.001                  |
| 6                                            | 0.488             | -0.000                 | 0.009              | 0.002             | -0.000                 | 0.002                  |
| 9                                            | 0.506             | -0.000                 | 0.007              | 0.002             | -0.000                 | 0.002                  |
| 10                                           | 0.361             | -0.000                 | 0.004              | 0.001             | -0.000                 | 0.001                  |
| 11                                           | 1.090             | -0.000                 | 0.006              | 0.001             | -0.000                 | 0.001                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 10.50                          | 2.10                 | 721.32                 | 7573.91              | 1.515                  | 36.87                  | 407.54               | 0.087                  | 0.55                   | 5.74                 | 0.0011                 |
| 6                       | 0.70                    | 51.50                          | 0.26                 | 843.90                 | 43460.84             | 0.217                  | 14.95                  | 770.06               | 0.004                  | 2.94                   | 151.43               | 0.0008                 |
| 9                       | 5.00                    | 51.00                          | 4.23                 | 881.04                 | 44933.18             | 3.729                  | 12.48                  | 636.26               | 0.053                  | 3.28                   | 167.35               | 0.0139                 |
| 10                      | 6.00                    | 21.50                          | 2.15                 | 474.76                 | 10207.40             | 1.021                  | 5.86                   | 125.94               | 0.013                  | 1.05                   | 22.57                | 0.0023                 |
| 11                      | 4.00                    | 11.80                          | 0.79                 | 609.52                 | 7192.29              | 0.482                  | 3.34                   | 39.45                | 0.003                  | 0.31                   | 3.69                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 9.531                |                        |                      | 6.964                  |                        |                      | 0.153                  |                        |                      | 0.0183                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.731                  |                        |                      | 0.016                  |                        |                      | 0.0019                 |

DATE: 6/24/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 207 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 2135008

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.68 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 91.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLO START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 31.50             | 0.11111           |
| TAXI-IDLE LOW        | 2            | 2.00        | 1                         | 4.50                              | 45.00             | 0.10000           |
| TAXI-IDLE HIGH       | 3            | 7.00        | 6                         | 9.00                              | 85.50             | 0.10526           |
| RUN-UP               | 4            | 19.10       | 19                        | 16.70                             | 166.50            | 0.10030           |
| TAKE-OFF 100%        | 6            | 88.60       | 88                        | 52.50                             | 580.50            | 0.09044           |
| CLIMB-LEAN           | 9            | 88.90       | 88                        | 51.00                             | 576.00            | 0.08854           |
| APPROACH             | 10           | 28.70       | 28                        | 22.50                             | 216.00            | 0.10417           |
| TAXI-IDLE            | 11           | 7.00        | 6                         | 10.00                             | 67.50             | 0.14815           |
| HOT START            | 13           | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 25000.00             | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 5000.00              | 45.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 92500.00            | -0.00                         | 8500.00              | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | 2200.00              | 65.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 2600.00              | 150.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 83000.00            | -0.00                         | 2000.00              | 180.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 2100.00              | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 107000.00           | -0.00                         | 4000.00              | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 35000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 716.19                             | 155.02                             | -0.00                               | -0.00                               | 0.70                               | -0.00                               | 2.58                    | 0.54                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 735.86                             | 33.44                              | -0.00                               | -0.00                               | 0.70                               | -0.00                               | 3.31                    | 0.15                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 832.65                             | 54.80                              | -0.00                               | -0.00                               | 0.74                               | -0.00                               | 7.49                    | 0.49                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 602.14                             | 14.68                              | -0.00                               | -0.00                               | 1.00                               | -0.00                               | 10.06                   | 0.25                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 6            | 887.63                             | 18.67                              | -0.00                               | -0.00                               | 2.54                               | -0.00                               | 46.60                   | 0.98                    | -0.00                    | -0.00                    | 0.13                    | -0.00                    |
| 9            | 872.76                             | 14.58                              | -0.00                               | -0.00                               | 3.11                               | -0.00                               | 44.51                   | 0.74                    | -0.00                    | -0.00                    | 0.16                    | -0.00                    |
| 10           | 472.62                             | 13.64                              | -0.00                               | -0.00                               | 0.82                               | -0.00                               | 10.63                   | 0.31                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 11           | 691.27                             | 20.12                              | -0.00                               | -0.00                               | 0.45                               | -0.00                               | 6.91                    | 0.20                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 383.98                             | 194.09                             | -0.00                               | -0.00                               | 0.67                               | -0.00                               | 1.34                    | 0.68                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|--------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|--------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-BASIS NOT CALCULABLE\*\*\*\*\*

|    |       |        |       |       |        |       |
|----|-------|--------|-------|-------|--------|-------|
| 2  | 1.656 | -0.000 | 0.075 | 0.002 | -0.000 | 0.002 |
| 3  | 1.071 | -0.000 | 0.070 | 0.001 | -0.000 | 0.001 |
| 4  | 0.526 | -0.000 | 0.013 | 0.001 | -0.000 | 0.001 |
| 6  | 0.526 | -0.000 | 0.011 | 0.002 | -0.000 | 0.002 |
| 9  | 0.501 | -0.000 | 0.008 | 0.002 | -0.000 | 0.002 |
| 10 | 0.371 | -0.000 | 0.011 | 0.001 | -0.000 | 0.001 |
| 11 | 0.988 | -0.000 | 0.029 | 0.001 | -0.000 | 0.001 |

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 9.00                           | 1.80                 | 832.65                 | 7493.83              | 1.497                  | 54.80                  | 493.17               | 0.099                  | 0.74                   | 6.65                 | 0.0013                 |
| 6                       | 0.30                    | 52.50                          | 0.26                 | 887.63                 | 46600.59             | 0.233                  | 18.67                  | 980.38               | 0.005                  | 2.54                   | 133.51               | 0.0007                 |
| 9                       | 5.00                    | 51.00                          | 4.23                 | 872.76                 | 44510.95             | 3.694                  | 14.58                  | 743.62               | 0.062                  | 3.11                   | 158.56               | 0.0132                 |
| 10                      | 6.00                    | 22.50                          | 2.25                 | 472.62                 | 10633.89             | 1.063                  | 13.64                  | 306.90               | 0.031                  | 0.82                   | 18.47                | 0.0010                 |
| 11                      | 4.00                    | 10.00                          | 0.67                 | 691.27                 | 6912.68              | 0.463                  | 20.12                  | 201.24               | 0.013                  | 0.45                   | 4.46                 | 0.0003                 |
| TOTAL FOR CYCLE         |                         |                                | 9.215                |                        |                      | 6.953                  |                        |                      | 0.209                  |                        |                      | 0.0173                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.754                  |                        |                      | 0.023                  |                        |                      | 0.0019                 |

DATE: 6/24/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 208 ENGINE TYPE AND MODEL: D-200-A

SERIAL NUMBER: 213500L

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.68 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 91.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |
| TAXI-IDLE LOW        | 2            | 2.10        | 2                         | 4.00                              | 40.50             | 0.09877           |
| TAXI-IDLE HIGH       | 3            | 6.60        | 6                         | 9.00                              | 76.50             | 0.11765           |
| RUN-UP               | 4            | 19.60       | 19                        | 13.30                             | 144.00            | 0.09236           |
| TAKE-OFF 100%        | 6            | 89.00       | 88                        | 52.30                             | 562.50            | 0.09298           |
| CLIMB-LEAN           | 9            | 88.50       | 88                        | 51.00                             | 562.50            | 0.09067           |
| APPROACH             | 10           | 28.50       | 28                        | 22.50                             | 211.50            | 0.10638           |
| TAXI-IDLE            | 11           | 6.60        | 6                         | 10.50                             | 72.00             | 0.14583           |
| HOT START            | 13           | 0.0         | 0                         | 3.60                              | 27.00             | 0.13333           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 76000.00            | -0.00                         | 39000.00             | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 5000.00              | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 9000.00              | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | 2100.00              | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 2800.00              | 185.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 2000.00              | 155.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 2000.00              | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 102000.00           | -0.00                         | 9500.00              | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 42000.00             | 45.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 561.20                             | 216.77                             | -0.00                               | -0.00                               | 0.61                               | -0.00                               | 1.96                    | 0.76                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 706.03                             | 33.74                              | -0.00                               | -0.00                               | 0.66                               | -0.00                               | 2.82                    | 0.13                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 790.75                             | 53.55                              | -0.00                               | -0.00                               | 0.56                               | -0.00                               | 7.17                    | 0.48                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 648.40                             | 14.86                              | -0.00                               | -0.00                               | 0.92                               | -0.00                               | 8.62                    | 0.20                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 6            | 866.16                             | 19.72                              | -0.00                               | -0.00                               | 3.06                               | -0.00                               | 45.30                   | 1.03                    | -0.00                    | -0.00                    | 0.16                    | -0.00                    |
| 9            | 885.67                             | 14.34                              | -0.00                               | -0.00                               | 2.62                               | -0.00                               | 45.17                   | 0.73                    | -0.00                    | -0.00                    | 0.13                    | -0.00                    |
| 10           | 463.53                             | 12.80                              | -0.00                               | -0.00                               | 0.73                               | -0.00                               | 10.43                   | 0.29                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 11           | 669.62                             | 48.35                              | -0.00                               | -0.00                               | 0.38                               | -0.00                               | 7.03                    | 0.51                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 387.04                             | 228.18                             | -0.00                               | -0.00                               | 0.53                               | -0.00                               | 1.40                    | 0.82                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                      |                           |                       |                      |                           |                           |
| 2                                            | 1.345                | -0.000                    | 0.064                 | 0.001                | -0.000                    | 0.001                     |
| 3                                            | 1.078                | -0.000                    | 0.073                 | 0.001                | -0.000                    | 0.001                     |
| 4                                            | 0.440                | -0.000                    | 0.010                 | 0.001                | -0.000                    | 0.001                     |
| 6                                            | 0.509                | -0.000                    | 0.012                 | 0.002                | -0.000                    | 0.002                     |
| 9                                            | 0.510                | -0.000                    | 0.008                 | 0.002                | -0.000                    | 0.002                     |
| 10                                           | 0.366                | -0.000                    | 0.010                 | 0.001                | -0.000                    | 0.001                     |
| 11                                           | 1.065                | -0.000                    | 0.077                 | 0.001                | -0.000                    | 0.001                     |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                      |                           |                       |                      |                           |                           |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 4.00                           | 1.80                 | 790.75                 | 7116.79              | 1.423                  | 53.55                | 481.45                 | 0.096                  | 0.56                 | 0.0010                 |
| 6                       | 0.70                    | 52.30                          | 0.26                 | 866.16                 | 45300.20             | 0.277                  | 19.72                | 1031.39                | 0.005                  | 3.06                 | 0.0008                 |
| 4                       | 5.00                    | 51.00                          | 4.23                 | 885.67                 | 45169.09             | 3.747                  | 14.34                | 731.24                 | 0.061                  | 2.62                 | 0.0111                 |
| 10                      | 6.00                    | 22.50                          | 2.25                 | 463.53                 | 10429.46             | 1.043                  | 12.80                | 287.90                 | 0.029                  | 0.73                 | 0.0016                 |
| 11                      | 4.00                    | 10.50                          | 0.70                 | 669.62                 | 7031.06              | 0.471                  | 48.35                | 507.64                 | 0.034                  | 0.38                 | 0.0003                 |
| TOTAL FOUR CYCLE        |                         |                                | 9.248                |                        |                      | 6.413                  |                      |                        | 0.225                  |                      | 0.0148                 |
| TOTAL FOP CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.748                  |                      |                        | 0.024                  |                      | 0.0016                 |

DATE: 6/23/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 209 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 213474

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.63 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 87.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |
| TAXI-IDLE LOW        | 2            | 2.60        | 2                         | 3.70                              | 40.50             | 0.09136           |
| TAXI-IDLE HIGH       | 3            | 7.50        | 7                         | 9.00                              | 81.00             | 0.11111           |
| RUN-UP               | 4            | 19.50       | 19                        | 13.20                             | 153.00            | 0.08627           |
| TAKE-OFF 100%        | 6            | 91.00       | 90                        | 52.50                             | 562.50            | 0.09333           |
| CLIMB-LEAN           | 9            | 91.50       | 91                        | 51.00                             | 562.50            | 0.09067           |
| APPROACH             | 10           | 29.10       | 29                        | 21.50                             | 202.50            | 0.10617           |
| TAXI-IDLE            | 11           | 7.50        | 7                         | 10.30                             | 67.50             | 0.15259           |
| NOT START            | 13           | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(CRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 76000.00            | -0.00                         | 27500.00             | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 27500.00             | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 42000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 30000.00            | -0.00                         | 9000.00              | 325.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 92500.00            | -0.00                         | 10000.00             | 140.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 86000.00            | -0.00                         | 18000.00             | 170.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 15000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 40000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 40000.00             | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>N2<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 561.73                             | 152.50                             | -0.00                               | -0.00                               | 0.49                               | -0.00                               | 1.97                    | 0.53                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 583.63                             | 53.48                              | -0.00                               | -0.00                               | 0.59                               | -0.00                               | 2.16                    | 0.20                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 634.06                             | 26.04                              | -0.00                               | -0.00                               | 0.77                               | -0.00                               | 5.71                    | 0.23                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 96.89                              | 6.68                               | -0.00                               | -0.00                               | 5.75                               | -0.00                               | 1.28                    | 0.09                    | -0.00                    | -0.00                    | 0.08                    | -0.00                    |
| 6            | 929.33                             | 7.02                               | -0.00                               | -0.00                               | 2.31                               | -0.00                               | 48.79                   | 0.37                    | -0.00                    | -0.00                    | 0.12                    | -0.00                    |
| 9            | 886.49                             | 12.91                              | -0.00                               | -0.00                               | 2.88                               | -0.00                               | 45.21                   | 0.66                    | -0.00                    | -0.00                    | 0.15                    | -0.00                    |
| 10           | 464.81                             | 9.61                               | -0.00                               | -0.00                               | 0.81                               | -0.00                               | 9.99                    | 0.21                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 11           | 464.24                             | 19.69                              | -0.00                               | -0.00                               | 0.57                               | -0.00                               | 4.78                    | 0.20                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 391.74                             | 221.82                             | -0.00                               | -0.00                               | 0.97                               | -0.00                               | 1.37                    | 0.78                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 0.831             | -0.000                 | 0.076              | 0.001             | -0.000                 | 0.001                  |
| 3                                           | 0.761             | -0.000                 | 0.031              | 0.001             | -0.000                 | 0.001                  |
| 4                                           | 0.066             | -0.000                 | 0.005              | 0.004             | -0.000                 | 0.004                  |
| 6                                           | 0.536             | -0.000                 | 0.004              | 0.001             | -0.000                 | 0.001                  |
| 9                                           | 0.494             | -0.000                 | 0.007              | 0.002             | -0.000                 | 0.002                  |
| 10                                          | 0.343             | -0.000                 | 0.007              | 0.001             | -0.000                 | 0.001                  |
| 11                                          | 0.638             | -0.000                 | 0.027              | 0.001             | -0.000                 | 0.001                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 9.00                           | 1.80                 | 634.06                 | 5706.56              | 1.141                  | 26.04                  | 234.39               | 0.047                  | 0.77                   | 6.97                 | 0.0014                 |
| 6                       | 0.30                    | 52.50                          | 0.26                 | 929.33                 | 48789.93             | 0.244                  | 7.02                   | 368.76               | 0.002                  | 2.31                   | 121.29               | 0.0006                 |
| 9                       | 5.00                    | 51.00                          | 4.23                 | 886.49                 | 45210.91             | 3.753                  | 12.91                  | 658.16               | 0.055                  | 2.88                   | 146.80               | 0.0122                 |
| 10                      | 6.00                    | 21.50                          | 2.15                 | 464.81                 | 9993.48              | 0.999                  | 9.61                   | 206.62               | 0.021                  | 0.81                   | 17.36                | 0.0017                 |
| 11                      | 4.00                    | 10.30                          | 0.69                 | 464.24                 | 4781.63              | 0.320                  | 19.69                  | 202.85               | 0.014                  | 0.57                   | 5.84                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 9.136                |                        |                      | 6.457                  |                        |                      | 0.138                  |                        |                      | 0.0163                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.707                  |                        |                      | 0.015                  |                        |                      | 0.0018                 |

DATE: 6/25/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 217 ENGINE TYPE AND MODEL: O-470-R

SERIAL NUMBER: 2113D5

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 29.05 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 84.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

| TEST MODE            | SHAFT HP | POWER PERCENT RATED | MEASURED FUEL FLOW LB/HR | AIR FLOW LB/HR | CALCULATED F/A |
|----------------------|----------|---------------------|--------------------------|----------------|----------------|
| COLD START + 130 SEC | 1        | 0.0                 | 0                        | 15.50          | 94.50          |
| TAXI-IDLE LOW        | 2        | 2.00                | 0                        | 18.00          | 126.00         |
| TAXI-IDLE HIGH       | 3        | 4.60                | 1                        | 19.70          | 162.00         |
| RUN-UP               | 4        | 23.90               | 10                       | 32.00          | 297.00         |
| TAKE-OFF 100%        | 6        | 191.10              | 83                       | 133.00         | 1345.50        |
| CLIMB-RICH           | 8        | 152.70              | 66                       | 88.00          | 1044.00        |
| CLIMB-LEAN           | 9        | 153.80              | 66                       | 86.50          | 1066.50        |
| APPROACH             | 10       | 39.00               | 16                       | 34.00          | 373.50         |
| TAXI-IDLE            | 11       | 4.30                | 1                        | 17.90          | 139.50         |
| HOT START            | 13       | 0.0                 | 0                        | 14.50          | 81.00          |

| TEST MODE | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 1         | -0.00                      | -0.00                     | 64000.00      | -0.00                | 50000.00       | 110.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 2         | -0.00                      | -0.00                     | 69000.00      | -0.00                | 50000.00       | 125.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 3         | -0.00                      | -0.00                     | 97500.00      | -0.00                | 47500.00       | 100.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 4         | -0.00                      | -0.00                     | 88000.00      | -0.00                | 45000.00       | 90.00         | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 6         | -0.00                      | -0.00                     | 120000.00     | -0.00                | 34000.00       | 92.00         | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 8         | -0.00                      | -0.00                     | 57000.00      | -0.00                | 12000.00       | 350.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 9         | -0.00                      | -0.00                     | 53000.00      | -0.00                | 10000.00       | 415.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 10        | -0.00                      | -0.00                     | 61500.00      | -0.00                | 25000.00       | 120.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 11        | -0.00                      | -0.00                     | 83000.00      | -0.00                | 50000.00       | 115.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 13        | -0.00                      | -0.00                     | 99000.00      | -0.00                | 50000.00       | 160.00        | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |

| TEST MODE | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|-----------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 1         | 372.66                    | 233.52                    | -0.00                      | -0.00                      | 1.05                      | -0.00                      | 5.78              | 3.62              | -0.00              | -0.00              | 0.02              | -0.00              |
| 2         | 463.11                    | 258.31                    | -0.00                      | -0.00                      | 1.38                      | -0.00                      | 8.34              | 4.65              | -0.00              | -0.00              | 0.07              | -0.00              |
| 3         | 767.15                    | 275.93                    | -0.00                      | -0.00                      | 1.29                      | -0.00                      | 15.12             | 5.44              | -0.00              | -0.00              | 0.03              | -0.00              |
| 4         | 776.52                    | 28.53                     | -0.00                      | -0.00                      | 1.30                      | -0.00                      | 24.85             | 0.91              | -0.00              | -0.00              | 0.04              | -0.00              |
| 6         | 1145.91                   | 22.93                     | -0.00                      | -0.00                      | 1.44                      | -0.00                      | 152.41            | 3.05              | -0.00              | -0.00              | 0.19              | -0.00              |
| 8         | 626.94                    | 9.06                      | -0.00                      | -0.00                      | 6.32                      | -0.00                      | 55.14             | 0.80              | -0.00              | -0.00              | 0.56              | -0.00              |
| 9         | 602.12                    | 7.75                      | -0.00                      | -0.00                      | 7.74                      | -0.00                      | 52.08             | 0.67              | -0.00              | -0.00              | 0.67              | -0.00              |
| 10        | 632.14                    | 17.87                     | -0.00                      | -0.00                      | 2.03                      | -0.00                      | 21.49             | 0.61              | -0.00              | -0.00              | 0.07              | -0.00              |
| 11        | 620.06                    | 279.34                    | -0.00                      | -0.00                      | 1.41                      | -0.00                      | 11.60             | 5.60              | -0.00              | -0.00              | 0.03              | -0.00              |
| 13        | 525.01                    | 219.09                    | -0.00                      | -0.00                      | 1.39                      | -0.00                      | 7.61              | 3.18              | -0.00              | -0.00              | 0.02              | -0.00              |

| TEST MODE                                    | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|----------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| *****HORSEPOWER-HP BASIS NOT CALCULABLE***** |                |                  |                 |                |                  |                  |
| 2                                            | 4.170          | -0.000           | 2.325           | 0.012          | -0.000           | 0.012            |
| 3                                            | 3.286          | -0.000           | 1.187           | 0.006          | -0.000           | 0.006            |
| 4                                            | 1.040          | -0.000           | 0.038           | 0.002          | -0.000           | 0.002            |
| 6                                            | 0.798          | -0.000           | 0.016           | 0.001          | -0.000           | 0.001            |
| 8                                            | 0.361          | -0.000           | 0.005           | 0.004          | -0.000           | 0.004            |
| 9                                            | 0.339          | -0.000           | 0.004           | 0.004          | -0.000           | 0.004            |
| 10                                           | 0.551          | -0.000           | 0.016           | 0.002          | -0.000           | 0.002            |
| 11                                           | 2.581          | -0.000           | 1.163           | 0.006          | -0.000           | 0.006            |
| *****HORSEPOWER-HP BASIS NOT CALCULABLE***** |                |                  |                 |                |                  |                  |

## LTO CYCLE EMISSIONS

| TEST MODE               | TIME IN MODE MIN. | MEASURED FUEL FLOW LB/HR | FUEL USFO LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
|-------------------------|-------------------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| 3                       | 12.00             | 19.70                    | 3.94           | 767.35           | 15116.75       | 3.023            | 275.93           | 5435.76        | 1.087            | 1.29             | 25.47          | 0.0051           |
| 6                       | 0.30              | 133.00                   | 0.66           | 1145.91          | 152405.88      | 0.762            | 22.93            | 3049.29        | 0.015            | 1.44             | 191.92         | 0.0010           |
| 9                       | 5.00              | 86.50                    | 7.18           | 602.12           | 52083.33       | 4.323            | 7.75             | 670.51         | 0.056            | 7.74             | 669.87         | 0.0556           |
| 10                      | 5.00              | 34.00                    | 3.40           | 632.14           | 21452.89       | 7.149            | 17.87            | 607.69         | 0.061            | 2.03             | 68.88          | 0.0069           |
| 11                      | 4.00              | 17.90                    | 1.20           | 620.06           | 11099.14       | 0.744            | 279.34           | 5000.11        | 0.335            | 1.41             | 25.26          | 0.0017           |
| TOTAL FOR CYCLE         |                   |                          | 16.384         |                  |                | 11.001           |                  |                | 1.554            |                  |                | 0.0702           |
| TOTAL FOR CYCLE/LB FUEL |                   |                          |                |                  |                | 0.671            |                  |                | 0.095            |                  |                | 0.0043           |

DATE: 6/28/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 218 ENGINE TYPE AND MODEL: O-470-R

SERIAL NUMBER: 211302A

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.53 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 109.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 15.40                             | 99.00             | 0.15556           |
| TAXI-IDLE LOW        | 2            | 1.50        | 0                         | 16.70                             | 117.00            | 0.14274           |
| TAXI-IDLE HIGH       | 3            | 4.20        | 1                         | 14.00                             | 153.00            | 0.09150           |
| RUN-UP               | 4            | 23.10       | 10                        | 33.00                             | 301.50            | 0.10945           |
| TAKE-OFF 100%        | 6            | 158.70      | 68                        | 130.00                            | 1323.00           | 0.09826           |
| CLIMB-RICH           | 8            | 155.30      | 67                        | 90.00                             | 1012.50           | 0.08889           |
| CLIMB-LEAN           | 9            | 156.80      | 68                        | 86.50                             | 1035.00           | 0.08357           |
| APPROACH             | 10           | 52.60       | 22                        | 42.00                             | 495.00            | 0.08485           |
| TAXI-IDLE            | 11           | 4.00        | 1                         | 17.10                             | 139.50            | 0.12258           |
| HOT START            | 13           | 0.0         | 0                         | 15.50                             | 103.50            | 0.14976           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 76500.00            | -0.00                         | 50000.00             | 120.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 50000.00             | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 48000.00             | 89.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 110000.00           | -0.00                         | 50000.00             | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 30000.00             | 62.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 15000.00             | 265.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 13000.00             | 360.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 16000.00             | 260.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 50000.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 59000.00            | -0.00                         | 50000.00             | 122.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 468.01                             | 242.74                             | -0.00                               | -0.00                               | 1.21                               | -0.00                               | 7.21                    | 3.74                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 2            | 521.10                             | 258.48                             | -0.00                               | -0.00                               | 1.21                               | -0.00                               | 8.70                    | 4.32                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 991.86                             | 341.91                             | -0.00                               | -0.00                               | 1.49                               | -0.00                               | 13.89                   | 4.79                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 950.98                             | 31.34                              | -0.00                               | -0.00                               | 0.71                               | -0.00                               | 31.38                   | 1.03                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 6            | 1144.52                            | 20.32                              | -0.00                               | -0.00                               | 0.97                               | -0.00                               | 151.39                  | 2.64                    | -0.00                    | -0.00                    | 0.13                    | -0.00                    |
| 8            | 641.80                             | 10.91                              | -0.00                               | -0.00                               | 4.54                               | -0.00                               | 57.76                   | 0.98                    | -0.00                    | -0.00                    | 0.41                    | -0.00                    |
| 9            | 594.51                             | 9.87                               | -0.00                               | -0.00                               | 6.51                               | -0.00                               | 51.43                   | 0.85                    | -0.00                    | -0.00                    | 0.56                    | -0.00                    |
| 10           | 575.94                             | 12.02                              | -0.00                               | -0.00                               | 4.64                               | -0.00                               | 24.19                   | 0.50                    | -0.00                    | -0.00                    | 0.19                    | -0.00                    |
| 11           | 574.55                             | 288.77                             | -0.00                               | -0.00                               | 1.15                               | -0.00                               | 5.82                    | 4.94                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 13           | 375.37                             | 249.57                             | -0.00                               | -0.00                               | 1.27                               | -0.00                               | 5.82                    | 3.87                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 5.802             | -0.000                 | 2.878              | 0.013             | -0.000                 | 0.013                  |
| 3                                           | 3.306             | -0.000                 | 1.140              | 0.005             | -0.000                 | 0.005                  |
| 4                                           | 1.359             | -0.000                 | 0.045              | 0.001             | -0.000                 | 0.001                  |
| 6                                           | 0.954             | -0.000                 | 0.017              | 0.001             | -0.000                 | 0.001                  |
| 8                                           | 0.372             | -0.000                 | 0.006              | 0.003             | -0.000                 | 0.003                  |
| 9                                           | 0.328             | -0.000                 | 0.005              | 0.004             | -0.000                 | 0.004                  |
| 10                                          | 0.460             | -0.000                 | 0.010              | 0.004             | -0.000                 | 0.004                  |
| 11                                          | 2.456             | -0.000                 | 1.234              | 0.005             | -0.000                 | 0.005                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 14.00                          | 2.80                 | 991.86                 | 13886.05             | 2.777                  | 341.91                 | 4786.76              | 0.957                  | 1.49                   | 20.82                | 0.0042                 |
| 6                       | 0.30                    | 130.00                         | 0.65                 | 1144.52                | 151388.06            | 0.757                  | 20.32                  | 2641.04              | 0.013                  | 0.97                   | 126.37               | 0.0006                 |
| 9                       | 5.00                    | 86.50                          | 7.18                 | 594.51                 | 51425.15             | 4.268                  | 9.87                   | 853.65               | 0.071                  | 6.51                   | 563.12               | 0.0467                 |
| 10                      | 6.00                    | 42.00                          | 4.20                 | 575.94                 | 24189.66             | 2.419                  | 12.02                  | 504.78               | 0.050                  | 4.64                   | 194.92               | 0.0195                 |
| 11                      | 4.00                    | 17.10                          | 1.15                 | 574.55                 | 9824.86              | 0.658                  | 288.77                 | 4937.97              | 0.331                  | 1.15                   | 19.63                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 15.975               |                        |                      | 10.880                 |                        |                      | 1.423                  |                        |                      | 0.0723                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.681                  |                        |                      | 0.089                  |                        |                      | 0.0045                 |

DATE: 6/28/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 219 ENGINE TYPE AND MODEL: O-470-R

SERIAL NUMBER: 470-R-2113028

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.58 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 114.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 11

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|----------------------------------|-------------------|-------------------|
| COLO START + 130 SEC | 1            | 0.0         | 0                         | 8.50                             | 81.00             | 0.10494           |
| TAXI-IDLE LOW        | 2            | 1.60        | 0                         | 8.80                             | 81.00             | 0.10864           |
| TAXI-IDLE HIGH       | 3            | 4.00        | 1                         | 12.70                            | 126.00            | 0.10079           |
| RUN-UP               | 4            | 22.00       | 9                         | 22.00                            | 252.00            | 0.08730           |
| TAKE-OFF 100%        | 6            | 186.30      | 80                        | 130.00                           | 1305.00           | 0.09962           |
| TAKE-OFF TO CLIMB    | 7            | 152.90      | 66                        | 91.00                            | 1026.00           | 0.08869           |
| CLIMB-RICH           | 8            | 150.60      | 65                        | 74.00                            | 999.00            | 0.07407           |
| CLIMB-LEAN           | 9            | 154.00      | 66                        | 86.50                            | 1039.50           | 0.08321           |
| APPROACH             | 10           | 37.00       | 16                        | 32.00                            | 346.50            | 0.09235           |
| TAXI-IDLE            | 11           | 4.40        | 1                         | 11.20                            | 117.00            | 0.09573           |
| HOT START            | 13           | 0.0         | 0                         | 8.50                             | 72.00             | 0.11806           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 20000.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 20000.00             | 45.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 10000.00             | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | 2200.00              | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 127000.00           | -0.00                         | 3100.00              | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 7            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | 1500.00              | 220.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 73000.00            | -0.00                         | 1000.00              | 1050.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 1300.00              | 335.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 71000.00            | -0.00                         | 1900.00              | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 5500.00              | 48.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 2900.00              | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS FMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 466.92                             | 129.22                             | -0.00                               | -0.00                               | 0.88                               | -0.00                               | 3.97                    | 1.10                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 452.16                             | 126.04                             | -0.00                               | -0.00                               | 0.64                               | -0.00                               | 3.94                    | 1.11                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 3            | 549.69                             | 66.50                              | -0.00                               | -0.00                               | 0.61                               | -0.00                               | 6.48                    | 0.84                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 624.77                             | 16.20                              | -0.00                               | -0.00                               | 1.57                               | -0.00                               | 13.74                   | 0.36                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 6            | 1148.84                            | 20.79                              | -0.00                               | -0.00                               | 0.93                               | -0.00                               | 149.35                  | 2.70                    | -0.00                    | -0.00                    | 0.12                    | -0.00                    |
| 7            | 664.41                             | 10.72                              | -0.00                               | -0.00                               | 3.77                               | -0.00                               | 60.83                   | 0.94                    | -0.00                    | -0.00                    | 0.14                    | -0.00                    |
| 8            | 888.81                             | 8.25                               | -0.00                               | -0.00                               | 21.00                              | -0.00                               | 65.77                   | 0.61                    | -0.00                    | -0.00                    | 1.55                    | -0.00                    |
| 9            | 985.01                             | 4.40                               | -0.00                               | -0.00                               | 6.07                               | -0.00                               | 50.60                   | 0.86                    | -0.00                    | -0.00                    | 0.53                    | -0.00                    |
| 10           | 715.57                             | 13.45                              | -0.00                               | -0.00                               | 1.32                               | -0.00                               | 22.90                   | 0.43                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 11           | 507.58                             | 37.94                              | -0.00                               | -0.00                               | 0.77                               | -0.00                               | 5.68                    | 0.42                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 418.09                             | 17.21                              | -0.00                               | -0.00                               | 0.53                               | -0.00                               | 3.55                    | 0.15                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 2.487             | -0.000                 | 0.693              | 0.004             | -0.000                 | 0.004                  |
| 3                                            | 1.745             | -0.000                 | 0.211              | 0.002             | -0.000                 | 0.002                  |
| 4                                            | 0.625             | -0.000                 | 0.016              | 0.002             | -0.000                 | 0.002                  |
| 6                                            | 0.802             | -0.000                 | 0.015              | 0.001             | -0.000                 | 0.001                  |
| 7                                            | 0.398             | -0.000                 | 0.007              | 0.002             | -0.000                 | 0.002                  |
| 8                                            | 0.437             | -0.000                 | 0.004              | 0.010             | -0.000                 | 0.010                  |
| 9                                            | 0.329             | -0.000                 | 0.006              | 0.003             | -0.000                 | 0.003                  |
| 10                                           | 0.619             | -0.000                 | 0.012              | 0.001             | -0.000                 | 0.001                  |
| 11                                           | 1.292             | -0.000                 | 0.047              | 0.002             | -0.000                 | 0.002                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTC CYCLE EMISSIONS

| TEST<br>MODE | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>2<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|--------------|-------------------------|--------------------------------|----------------------|------------------------|---------------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3            | 12.00                   | 12.70                          | 2.54                 | 544.69                 | 6961.07                   | 1.396                  | 66.50                  | 944.56               | 0.149                  | 0.61                   | 7.77                 | 0.0016                 |
| 6            | 0.30                    | 130.00                         | 0.65                 | 1148.84                | 149349.50                 | 0.747                  | 20.79                  | 2702.54              | 0.014                  | 0.93                   | 120.65               | 0.0006                 |
| 9            | 5.00                    | 86.50                          | 7.18                 | 585.01                 | 50603.19                  | 4.200                  | 9.90                   | 856.24               | 0.071                  | 6.07                   | 25.37                | 0.0036                 |
| 10           | 6.00                    | 32.00                          | 3.20                 | 715.57                 | 22898.30                  | 2.290                  | 13.45                  | 430.27               | 0.043                  | 1.32                   | 42.38                | 0.0042                 |
| 11           | 4.00                    | 11.20                          | 0.75                 | 507.58                 | 5684.90                   | 0.381                  | 37.94                  | 424.98               | 0.028                  | 0.77                   | 8.62                 | 0.0006                 |

TOTAL FOR CYCLE 14.370

9.014

0.325

0.0506

TOTAL FOR CYCLE/LB FUEL

0.629

0.023

0.0035

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA .....

CAL ID NUMBER: 210 ENGINE TYPE AND MODEL: 10-520-P

SERIAL NUMBER: 159850A

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: 4V GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.96 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 10.60                             | 81.00             | 0.13086           |
| TAXI-IDLE LOW        | 2            | 1.90        | 0                         | 11.00                             | 85.50             | 0.12865           |
| TAXI-IDLE HIGH       | 3            | 4.60        | 1                         | 16.00                             | 130.50            | 0.12261           |
| RUN-UP               | 4            | 24.00       | 7                         | 36.00                             | 306.00            | 0.11765           |
| TAKE-OFF 100%        | 6            | 263.70      | 87                        | 145.00                            | 1566.00           | 0.09259           |
| CLIMB-RICH           | 8            | 202.10      | 67                        | 110.00                            | 1188.00           | 0.09259           |
| CLIMB-LEAN           | 9            | 202.90      | 67                        | 92.00                             | 1183.50           | 0.07774           |
| APPROACH             | 10           | 35.40       | 11                        | 45.00                             | 378.00            | 0.11905           |
| TAXI-IDLE            | 11           | 4.60        | 1                         | 16.00                             | 117.00            | 0.13675           |
| HOT START            | 13           | 0.0         | 0                         | 10.50                             | 81.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | -0.00                | 47.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | -0.00                | 460.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | -0.00                | 470.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 10000.00            | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 81000.00            | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 81000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 544.96                             | -0.00                              | -0.00                               | -0.00                               | 0.57                               | -0.00                               | 5.78                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 516.70                             | -0.00                              | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 5.68                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 462.98                             | -0.00                              | -0.00                               | -0.00                               | 0.32                               | -0.00                               | 7.41                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 440.84                             | -0.00                              | -0.00                               | -0.00                               | 0.40                               | -0.00                               | 15.87                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 6            | 625.75                             | -0.00                              | -0.00                               | -0.00                               | 7.69                               | -0.00                               | 90.73                   | -0.00                   | -0.00                    | -0.00                    | 1.11                    | -0.00                    |
| 8            | 625.75                             | -0.00                              | -0.00                               | -0.00                               | 7.85                               | -0.00                               | 68.83                   | -0.00                   | -0.00                    | -0.00                    | 0.86                    | -0.00                    |
| 9            | 118.33                             | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | 10.89                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 10           | 653.84                             | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | 29.42                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 11           | 415.98                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 6.66                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 602.09                             | -0.00                              | -0.00                               | -0.00                               | 0.31                               | -0.00                               | 6.32                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 2.991             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 3                                           | 1.610             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 4                                           | 0.661             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 6                                           | 0.344             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 8                                           | 0.341             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 9                                           | 0.054             | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 10                                          | 0.831             | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 11                                          | 1.447             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 16.00                          | 3.20                 | 462.98                 | 7407.62              | 1.482                  | -0.00                  | -0.00                | -0.000                 | 0.32                   | 5.16                 | 0.0010                 |
| 6                       | 0.30                    | 145.00                         | 0.72                 | 625.75                 | 90733.19             | 0.454                  | -0.00                  | -0.00                | -0.000                 | 7.69                   | 1114.73              | 0.0056                 |
| 9                       | 5.00                    | 92.00                          | 7.64                 | 118.33                 | 10886.68             | 0.904                  | -0.00                  | -0.00                | -0.000                 | -0.00                  | -0.00                | -0.0000                |
| 10                      | 6.00                    | 45.00                          | 4.50                 | 653.84                 | 29422.80             | 2.942                  | -0.00                  | -0.00                | -0.000                 | -0.00                  | -0.00                | -0.0000                |
| 11                      | 4.00                    | 16.00                          | 1.07                 | 415.98                 | 6655.64              | 0.446                  | -0.00                  | -0.00                | -0.000                 | 0.35                   | 5.56                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 17.133               |                        |                      | 6.227                  |                        |                      | -0.000                 |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.363                  |                        |                      | -0.000                 |                        |                      | -0.0000                |

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 211 ENGINE TYPE AND MODEL: 10-520-P

SERIAL NUMBER: 1598508

RATE HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.96 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SFC | 1            | 0.0         | 0                         | 10.80                             | 81.00             | 0.1333            |
| TAXI-IDLE LOW        | 2            | 1.90        | 0                         | 12.30                             | 85.50             | 0.14386           |
| TAXI-IDLE HIGH       | 3            | 4.80        | 1                         | 15.20                             | 121.50            | 0.12510           |
| RUN-UP               | 4            | 24.20       | 8                         | 37.00                             | 310.50            | 0.11916           |
| TAKE-OFF 100%        | 6            | 264.20      | 88                        | 145.00                            | 1633.50           | 0.08877           |
| CLIMB-RICH           | 8            | 202.30      | 67                        | 111.00                            | 1197.00           | 0.09273           |
| CLIMB-LFAN           | 9            | 203.30      | 67                        | 92.00                             | 1192.50           | 0.07715           |
| APPROACH             | 10           | 35.80       | 11                        | 48.00                             | 369.00            | 0.13008           |
| TAXI-IDLE            | 11           | 4.50        | 1                         | 14.50                             | 112.50            | 0.12889           |
| HOT START            | 13           | 0.0         | 0                         | 10.50                             | 81.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(KFT)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 76500.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 62000.00            | -0.00                         | -0.00                | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | -0.00                | 47.00               | -0.00                    | -0.00                    | -0.00     | -0.30 | -0.00        |
| 6            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 410.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 410.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8003.00             | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 62000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 78000.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/IK<br>LB FUEL | MASS FMI<br>HC<br>LB/IK<br>LB FUEL | MASS FMI<br>NO2<br>LB/IK<br>LB FUEL | MASS FMI<br>CO2<br>LB/IK<br>LB FUEL | MASS FMI<br>NO<br>LB/IK<br>LB FUEL | MASS FMI<br>NOX<br>LB/IK<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 553.09                             | -0.00                              | -0.00                               | -0.00                               | 0.65                               | -0.00                               | 5.97                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 462.35                             | -0.00                              | -0.00                               | -0.00                               | 0.39                               | -0.00                               | 5.69                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 477.17                             | -0.00                              | -0.00                               | -0.00                               | 0.53                               | -0.00                               | 7.25                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 419.36                             | -0.00                              | -0.00                               | -0.00                               | 0.62                               | -0.00                               | 15.52                   | -0.00                   | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 6            | 570.25                             | -0.00                              | -0.00                               | -0.00                               | 7.11                               | -0.00                               | 82.64                   | -0.00                   | -0.00                    | -0.00                    | 1.03                    | -0.00                    |
| 8            | 599.51                             | -0.00                              | -0.00                               | -0.00                               | 6.84                               | -0.00                               | 66.55                   | -0.00                   | -0.00                    | -0.00                    | 0.76                    | -0.00                    |
| 9            | 95.27                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | 8.76                    | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 10           | 459.29                             | -0.00                              | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 22.05                   | -0.00                   | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 11           | 441.03                             | -0.00                              | -0.00                               | -0.00                               | 0.52                               | -0.00                               | 6.39                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 579.79                             | -0.00                              | -0.00                               | -0.00                               | 0.67                               | -0.00                               | 6.04                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 2.993             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 3                                            | 1.511             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 4                                            | 0.641             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 6                                            | 0.313             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 8                                            | 0.329             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 9                                            | 0.043             | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 10                                           | 0.616             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 11                                           | 1.421             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTH CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 15.20                          | 3.04                 | 477.12                 | 7252.21              | 1.450                  | -0.00                  | -0.00                | -0.000                 | 0.53                   | 8.07                 | 0.0016                 |
| 4                       | 0.30                    | 145.00                         | 0.72                 | 570.25                 | 82686.63             | 0.413                  | -0.00                  | -0.00                | -0.000                 | 7.11                   | 1031.21              | 0.0052                 |
| 9                       | 5.00                    | 92.00                          | 7.64                 | 95.27                  | 8764.99              | 0.727                  | -0.00                  | -0.00                | -0.000                 | -0.00                  | -0.00                | -0.0000                |
| 10                      | 6.00                    | 48.00                          | 4.80                 | 459.29                 | 22045.49             | 2.205                  | -0.00                  | -0.00                | -0.000                 | 0.43                   | 20.44                | 0.0020                 |
| 11                      | 4.00                    | 14.50                          | 0.97                 | 441.03                 | 6394.95              | 0.428                  | -0.00                  | -0.00                | -0.000                 | 0.52                   | 7.48                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 17.172               |                        |                      | 5.224                  |                        |                      | -0.000                 |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.304                  |                        |                      | -0.000                 |                        |                      | -0.0000                |

DATE: 6/22/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 212 ENGINE TYPE AND MODEL: 10-520-P

SERIAL NUMBER: 159977A

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.94 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 11.50                             | 81.00             | 0.14198           |
| TAXI-IDLE HIGH       | 3            | 4.60        | 1                         | 18.10                             | 144.00            | 0.12569           |
| RUN-UP               | 4            | 23.60       | 7                         | 39.00                             | 315.00            | 0.12381           |
| TAKE-OFF 100%        | 6            | 261.40      | 87                        | 154.00                            | 1597.50           | 0.09640           |
| CLIMB-RICH           | 8            | 200.00      | 66                        | 123.00                            | 1192.50           | 0.10314           |
| CLIMB-LEAN           | 9            | 204.80      | 68                        | 92.00                             | 1183.50           | 0.07774           |
| APPROACH             | 10           | 37.30       | 12                        | 46.00                             | 396.00            | 0.11616           |
| TAXI-IDLE            | 11           | 4.20        | 1                         | 14.60                             | 117.00            | 0.12479           |
| HOT START            | 13           | 0.0         | 0                         | 8.10                              | 67.50             | 0.12000           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 87500.00            | -0.00                         | 47500.00             | 145.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 42500.00             | 177.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 116000.00           | -0.00                         | 9000.00              | 125.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 87500.00            | -0.00                         | 2400.00              | 205.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 2400.00              | 175.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 9000.00             | -0.00                         | 1300.00              | 2250.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 11000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 37500.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 73500.00            | -0.00                         | 45000.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 594.18                             | 246.51                             | -0.00                               | -0.00                               | 1.62                               | -0.00                               | 6.83                    | 2.83                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 398.34                             | 241.02                             | -0.00                               | -0.00                               | 2.23                               | -0.00                               | 7.21                    | 4.36                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 4            | 901.71                             | 51.60                              | -0.00                               | -0.00                               | 1.60                               | -0.00                               | 35.17                   | 2.01                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 858.84                             | 16.48                              | -0.00                               | -0.00                               | 3.31                               | -0.00                               | 132.26                  | 2.54                    | -0.00                    | -0.00                    | 0.51                    | -0.00                    |
| 8            | 900.07                             | 15.70                              | -0.00                               | -0.00                               | 2.65                               | -0.00                               | 110.71                  | 1.93                    | -0.00                    | -0.00                    | 0.33                    | -0.00                    |
| 9            | 106.50                             | 10.38                              | -0.00                               | -0.00                               | 43.73                              | -0.00                               | 9.80                    | 0.95                    | -0.00                    | -0.00                    | 4.02                    | -0.00                    |
| 10           | 1008.09                            | 66.05                              | -0.00                               | -0.00                               | 0.75                               | -0.00                               | 46.37                   | 3.04                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 11           | 416.58                             | 213.79                             | -0.00                               | -0.00                               | 0.76                               | -0.00                               | 6.08                    | 3.12                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 588.79                             | 263.93                             | -0.00                               | -0.00                               | 0.79                               | -0.00                               | 4.77                    | 2.14                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                | CU<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 3                                           | 1.567             | -0.000                 | 0.448              | 0.009             | -0.000                 | 0.009                  |
| 4                                           | 1.490             | -0.000                 | 0.085              | 0.003             | -0.000                 | 0.003                  |
| 6                                           | 0.506             | -0.000                 | 0.010              | 0.002             | -0.000                 | 0.002                  |
| 8                                           | 0.554             | -0.000                 | 0.010              | 0.002             | -0.000                 | 0.002                  |
| 9                                           | 0.048             | -0.000                 | 0.005              | 0.020             | -0.000                 | 0.020                  |
| 10                                          | 1.243             | -0.000                 | 0.081              | 0.001             | -0.000                 | 0.001                  |
| 11                                          | 1.448             | -0.000                 | 0.743              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 18.10                          | 3.62                 | 398.34                 | 7209.88              | 1.442                  | 241.02                 | 4362.54              | 0.873                  | 2.23                   | 40.31                | 0.0081                 |
| 6                       | 0.30                    | 154.00                         | 0.77                 | 858.84                 | 132261.56            | 0.661                  | 16.48                  | 2537.19              | 0.013                  | 3.31                   | 508.98               | 0.0025                 |
| 9                       | 5.00                    | 92.00                          | 7.64                 | 106.50                 | 9798.02              | 0.813                  | 10.38                  | 954.74               | 0.079                  | 43.73                  | 4023.45              | 0.3339                 |
| 10                      | 6.00                    | 46.00                          | 4.60                 | 1008.09                | 46372.05             | 4.637                  | 66.05                  | 3038.48              | 0.304                  | 0.75                   | 34.34                | 0.0034                 |
| 11                      | 4.00                    | 14.60                          | 0.98                 | 416.58                 | 6082.04              | 0.407                  | 213.79                 | 3121.36              | 0.209                  | 0.76                   | 11.10                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                |                      | 17.604                 |                      | 7.961                  |                        |                      | 1.477                  |                        |                      | 0.3487                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.452                  |                        |                      | 0.084                  |                        |                      | 0.0198                 |

DATE: 6/22/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 213 ENGINE TYPE AND MODEL: 1D-520-P

SERIAL NUMBER: 159977B

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.94 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLO START + 130 SEC | 1            | 0.0         | 0                         | 9.60                              | 76.50             | 0.12549           |
| TAXI-IDLE LOW        | 2            | 2.60        | 0                         | 10.50                             | 81.00             | 0.12963           |
| TAXI-IDLE HIGH       | 3            | 6.10        | 2                         | 17.20                             | 135.00            | 0.12741           |
| RUN-UP               | 4            | 26.60       | 8                         | 37.00                             | 315.00            | 0.11746           |
| TAKE-OFF 100%        | 6            | 262.80      | 87                        | 152.00                            | 1548.00           | 0.09819           |
| CLIMB-RICH           | 8            | 206.20      | 68                        | 123.00                            | 1206.00           | 0.10199           |
| CLIMB-LEAN           | 9            | 209.20      | 69                        | 92.00                             | 1188.00           | 0.07744           |
| APPROACH             | 10           | 40.00       | 13                        | 46.00                             | 391.50            | 0.11750           |
| TAXI-IDLE            | 11           | 5.70        | 1                         | 14.20                             | 117.00            | 0.12137           |
| HOT START            | 13           | 0.0         | 0                         | 10.00                             | 67.50             | 0.14815           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 9500.00             | -0.00                         | 50000.00             | 295.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 84500.00            | -0.00                         | 50000.00             | 112.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | 42500.00             | 85.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 117000.00           | -0.00                         | 9500.00              | 68.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 88000.00            | -0.00                         | 2500.00              | 215.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 92500.00            | -0.00                         | 2300.00              | 190.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8330.00             | -0.00                         | 1700.00              | 2825.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 1100.00              | 87.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 50000.00             | 100.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 50000.00             | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 72.89                              | 283.89                             | -0.00                               | -0.00                               | 3.72                               | -0.00                               | 0.70                    | 2.73                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 2            | 628.11                             | 277.27                             | -0.00                               | -0.00                               | 1.37                               | -0.00                               | 6.60                    | 2.91                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 3            | 446.04                             | 238.66                             | -0.00                               | -0.00                               | 1.06                               | -0.00                               | 7.67                    | 4.11                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 956.61                             | 56.59                              | -0.00                               | -0.00                               | 0.91                               | -0.00                               | 35.39                   | 2.09                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 6            | 849.56                             | 16.94                              | -0.00                               | -0.00                               | 3.41                               | -0.00                               | 129.13                  | 2.57                    | -0.00                    | -0.00                    | 0.52                    | -0.00                    |
| 8            | 862.75                             | 15.17                              | -0.00                               | -0.00                               | 2.91                               | -0.00                               | 106.12                  | 1.47                    | -0.00                    | -0.00                    | 0.36                    | -0.00                    |
| 9            | 98.53                              | 4.60                               | -0.00                               | -0.00                               | 55.08                              | -0.00                               | 9.06                    | 0.88                    | -0.00                    | -0.00                    | 5.07                    | -0.00                    |
| 10           | 977.19                             | 6.55                               | -0.00                               | -0.00                               | 1.17                               | -0.00                               | 45.87                   | 0.30                    | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 11           | 417.05                             | 290.86                             | -0.00                               | -0.00                               | 1.30                               | -0.00                               | 5.85                    | 4.13                    | -0.00                    | -0.00                    | 0.07                    | -0.00                    |
| 13           | 481.27                             | 251.55                             | -0.00                               | -0.00                               | 1.18                               | -0.00                               | 4.81                    | 2.52                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 2.537             | -0.000                 | 1.120              | 0.006             | -0.000                 | 0.036                  |
| 3                                           | 1.259             | -0.000                 | 0.673              | 0.003             | -0.000                 | 0.003                  |
| 4                                           | 1.331             | -0.000                 | 0.079              | 0.001             | -0.000                 | 0.001                  |
| 6                                           | 0.491             | -0.000                 | 0.010              | 0.002             | -0.000                 | 0.002                  |
| 8                                           | 0.515             | -0.000                 | 0.009              | 0.002             | -0.000                 | 0.002                  |
| 9                                           | 0.043             | -0.000                 | 0.004              | 0.024             | -0.000                 | 0.024                  |
| 10                                          | 1.147             | -0.000                 | 0.008              | 0.001             | -0.000                 | 0.001                  |
| 11                                          | 1.027             | -0.000                 | 0.725              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTH CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 17.20                          | 3.44                 | 446.04                 | 7671.91              | 1.534                  | 238.66                 | 4105.03              | 0.821                  | 1.06                   | 18.15                | 0.0036                 |
| 6                       | 0.30                    | 152.00                         | 0.76                 | 849.56                 | 129132.56            | 0.646                  | 16.94                  | 2574.63              | 0.013                  | 3.41                   | 518.27               | 0.0026                 |
| 9                       | 5.00                    | 92.00                          | 7.64                 | 98.53                  | 9064.78              | 0.752                  | 5.60                   | 881.61               | 0.073                  | 55.08                  | 5067.79              | 0.4206                 |
| 10                      | 6.70                    | 46.00                          | 4.60                 | 997.19                 | 45870.74             | 4.587                  | 6.55                   | 301.35               | 0.030                  | 1.17                   | 53.73                | 0.0054                 |
| 11                      | 4.00                    | 14.20                          | 0.95                 | 412.05                 | 5851.16              | 0.392                  | 290.86                 | 4130.23              | 0.277                  | 1.30                   | 18.48                | 0.0012                 |
| TOTAL FOR CYCLE         |                         |                                | 17.187               |                        |                      | 7.912                  |                        |                      | 1.214                  |                        |                      | 0.4335                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.455                  |                        |                      | 0.070                  |                        |                      | 0.0249                 |

DATE: 6/23/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 214 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 159982A

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 85.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 10.00                             | 81.00             | 0.12346           |
| TAXI-IDLE LOW        | 2            | 2.30        | 0                         | 10.50                             | 99.00             | 0.10606           |
| TAXI-IDLE HIGH       | 3            | 5.40        | 1                         | 14.30                             | 130.50            | 0.10958           |
| RUN-UP               | 4            | 25.40       | 8                         | 31.00                             | 288.00            | 0.10764           |
| TAKE-OFF 100%        | 6            | 259.80      | 86                        | 144.00                            | 1534.50           | 0.09384           |
| CLIMB-RICH           | 8            | 205.90      | 68                        | 112.00                            | 1206.00           | 0.09287           |
| CLIMB-LEAN           | 9            | 207.70      | 69                        | 92.00                             | 1188.00           | 0.07744           |
| APPROACH             | 10           | 32.30       | 10                        | 34.50                             | 306.00            | 0.11275           |
| TAXI-IDLE            | 11           | 5.00        | 1                         | 13.00                             | 112.50            | 0.11556           |
| HOT START            | 13           | 0.0         | 0                         | 8.30                              | 63.00             | 0.13175           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES | SMDKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 20000.00             | 100.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 90000.00            | -0.00                         | 10000.00             | 150.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 3500.00              | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 2900.00              | 140.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 2000.00              | 310.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 2000.00              | 420.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8000.00             | -0.00                         | 1600.00              | 2875.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 81000.00            | -0.00                         | 3600.00              | 115.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 7500.00              | 85.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 37500.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 403.23                             | 114.91                             | -0.00                               | -0.00                               | 1.27                               | -0.00                               | 4.03                    | 1.15                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 805.64                             | 64.12                              | -0.00                               | -0.00                               | 2.21                               | -0.00                               | 8.46                    | 0.67                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 677.39                             | 21.92                              | -0.00                               | -0.00                               | 1.57                               | -0.00                               | 9.69                    | 0.31                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 476.82                             | 18.40                              | -0.00                               | -0.00                               | 2.03                               | -0.00                               | 14.78                   | 0.57                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 665.20                             | 13.99                              | -0.00                               | -0.00                               | 5.09                               | -0.00                               | 95.79                   | 2.02                    | -0.00                    | -0.00                    | 0.73                    | -0.00                    |
| 8            | 575.48                             | 14.10                              | -0.00                               | -0.00                               | 6.97                               | -0.00                               | 64.45                   | 1.58                    | -0.00                    | -0.00                    | 0.78                    | -0.00                    |
| 9            | 94.49                              | 12.81                              | -0.00                               | -0.00                               | 55.78                              | -0.00                               | 8.69                    | 1.18                    | -0.00                    | -0.00                    | 5.13                    | -0.00                    |
| 10           | 684.91                             | 22.09                              | -0.00                               | -0.00                               | 1.60                               | -0.00                               | 23.63                   | 0.76                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 11           | 437.85                             | 45.21                              | -0.00                               | -0.00                               | 1.15                               | -0.00                               | 5.69                    | 0.59                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 483.98                             | 205.52                             | -0.00                               | -0.00                               | 1.08                               | -0.00                               | 4.02                    | 1.71                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 3.678             | -0.000                 | 0.293              | 0.010             | -0.000                 | 0.010                  |
| 3                                           | 1.794             | -0.000                 | 0.058              | 0.004             | -0.000                 | 0.004                  |
| 4                                           | 0.582             | -0.000                 | 0.022              | 0.002             | -0.000                 | 0.002                  |
| 6                                           | 0.369             | -0.000                 | 0.008              | 0.003             | -0.000                 | 0.003                  |
| 8                                           | 0.313             | -0.000                 | 0.008              | 0.004             | -0.000                 | 0.004                  |
| 9                                           | 0.042             | -0.000                 | 0.006              | 0.025             | -0.000                 | 0.025                  |
| 10                                          | 0.732             | -0.000                 | 0.024              | 0.002             | -0.000                 | 0.002                  |
| 11                                          | 1.138             | -0.000                 | 0.118              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00           | 14.30                          | 2.86                 | 677.39                 | 9686.64              | 1.937                  | 21.92                  | 313.47               | 0.063                  | 1.57                   | 22.44                | 0.0045                 |
| 6                       | 0.30            | 144.00                         | 0.72                 | 665.20                 | 95788.94             | 0.479                  | 13.99                  | 2015.16              | 0.010                  | 5.09                   | 733.46               | 0.0037                 |
| 9                       | 5.00            | 92.00                          | 7.64                 | 94.49                  | 8692.87              | 0.772                  | 12.81                  | 1178.14              | 0.098                  | 55.78                  | 5131.35              | 0.4259                 |
| 10                      | 6.00            | 34.50                          | 3.45                 | 684.91                 | 23629.47             | 2.363                  | 22.09                  | 762.07               | 0.076                  | 1.60                   | 55.10                | 0.0055                 |
| 11                      | 4.00            | 13.00                          | 0.87                 | 437.85                 | 5692.07              | 0.381                  | 45.21                  | 587.70               | 0.039                  | 1.15                   | 14.99                | 0.0010                 |
| TOTAL FOR CYCLE         |                 |                                | 15.937               |                        |                      | 5.882                  |                        |                      | 0.286                  |                        |                      | 0.4406                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                      | 0.379                  |                        |                      | 0.018                  |                        |                      | 0.0284                 |

DATE: 6/23/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 215 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 1599828

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. HAS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 85.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 8.10                              | 63.00             | 0.12857           |
| TAXI-IDLE LOW        | 2            | 1.80        | 0                         | 10.30                             | 81.00             | 0.12716           |
| TAXI-IDLE HIGH       | 3            | 4.80        | 1                         | 13.40                             | 121.50            | 0.11029           |
| RUN-UP               | 4            | 23.50       | 7                         | 30.50                             | 279.00            | 0.10932           |
| TAKF-OFF 100%        | 6            | 263.00      | 87                        | 146.00                            | 1561.50           | 0.09350           |
| CLIMB-RICH           | 8            | 207.30      | 69                        | 112.00                            | 1224.00           | 0.09150           |
| CLIMB-LEAN           | 9            | 209.50      | 69                        | 92.00                             | 1210.50           | 0.07600           |
| APPROACH             | 10           | 18.00       | 12                        | 37.00                             | 360.00            | 0.10278           |
| TAXI-IDLE            | 11           | 5.00        | 1                         | 12.80                             | 117.00            | 0.10940           |
| HOT START            | 13           | 0.0         | 0                         | 7.50                              | 63.00             | 0.11905           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 10000.00            | -0.00                         | 35000.00             | 165.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 54070.00            | -0.00                         | 22500.00             | 208.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 7500.00              | 70.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 33000.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 71500.00            | -0.00                         | 2300.00              | 295.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 2000.00              | 400.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 10000.00            | -0.00                         | 1500.00              | 2625.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 83000.00            | -0.00                         | 3800.00              | 115.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 7500.00              | 75.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 66570.00            | -0.00                         | 37500.00             | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 74.54                              | 195.25                             | -0.00                               | -0.00                               | 2.02                               | -0.00                               | 0.60                    | 1.58                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 2            | 406.90                             | 176.53                             | -0.00                               | -0.00                               | 2.57                               | -0.00                               | 4.19                    | 1.30                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 3            | 574.05                             | 46.76                              | -0.00                               | -0.00                               | 0.99                               | -0.00                               | 7.69                    | 0.63                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 578.79                             | 207.04                             | -0.00                               | -0.00                               | 1.29                               | -0.00                               | 17.65                   | 0.31                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 6            | 717.54                             | 16.13                              | -0.00                               | -0.00                               | 4.86                               | -0.00                               | 104.76                  | 2.36                    | -0.00                    | -0.00                    | 0.71                    | -0.00                    |
| 8            | 583.08                             | 14.25                              | -0.00                               | -0.00                               | 6.72                               | -0.00                               | 65.31                   | 1.60                    | -0.00                    | -0.00                    | 0.75                    | -0.00                    |
| 9            | 119.98                             | 12.16                              | -0.00                               | -0.00                               | 51.73                              | -0.00                               | 11.04                   | 1.12                    | -0.00                    | -0.00                    | 4.76                    | -0.00                    |
| 10           | 764.78                             | 24.92                              | -0.00                               | -0.00                               | 1.74                               | -0.00                               | 28.30                   | 0.92                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 11           | 452.27                             | 47.03                              | -0.00                               | -0.00                               | 1.07                               | -0.00                               | 5.79                    | 0.60                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 534.03                             | 221.22                             | -0.00                               | -0.00                               | 1.06                               | -0.00                               | 4.01                    | 1.66                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 2.328             | -0.000                 | 0.724              | 0.015             | -0.000                 | 0.015                  |
| 3                                            | 1.603             | -0.000                 | 0.131              | 0.003             | -0.000                 | 0.003                  |
| 4                                            | 0.751             | -0.000                 | 0.269              | 0.002             | -0.000                 | 0.002                  |
| 6                                            | 0.398             | -0.000                 | 0.009              | 0.003             | -0.000                 | 0.003                  |
| 8                                            | 0.315             | -0.000                 | 0.008              | 0.004             | -0.000                 | 0.004                  |
| 9                                            | 0.053             | -0.000                 | 0.005              | 0.023             | -0.000                 | 0.023                  |
| 10                                           | 0.745             | -0.000                 | 0.024              | 0.002             | -0.000                 | 0.002                  |
| 11                                           | 1.158             | -0.000                 | 0.120              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>2<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|---------------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 13.40                          | 2.68                 | 574.05                 | 7692.21                   | 1.538                  | 46.76                  | 626.52               | 0.125                  | 0.49                   | 13.30                | 0.0027                 |
| 6                       | 0.30                    | 146.00                         | 0.73                 | 717.54                 | 104761.31                 | 0.524                  | 16.13                  | 2355.70              | 0.012                  | 4.86                   | 709.47               | 0.0035                 |
| 9                       | 5.00                    | 92.00                          | 7.64                 | 119.98                 | 11038.04                  | 0.916                  | 12.16                  | 1118.87              | 0.093                  | 51.73                  | 4759.28              | 0.3950                 |
| 10                      | 6.00                    | 37.00                          | 3.70                 | 764.78                 | 28296.92                  | 2.830                  | 24.92                  | 922.05               | 0.092                  | 1.74                   | 64.40                | 0.0064                 |
| 11                      | 4.00                    | 12.80                          | 0.96                 | 452.27                 | 5789.10                   | 0.788                  | 47.03                  | 601.96               | 0.040                  | 1.07                   | 13.71                | 0.0009                 |
| TOTAL FOR CYCLE         |                         |                                | 15.604               |                        |                           | 6.196                  |                        |                      | 0.362                  |                        |                      | 0.4086                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                           | 0.397                  |                        |                      | 0.023                  |                        |                      | 0.0262                 |

DATE: 6/24/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 216 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 159983

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.76 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 83.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 10.50                             | 90.00             | 0.11667           |
| TAXI-IDLE LOW        | 2            | 1.70        | 0                         | 11.30                             | 108.00            | 0.10463           |
| TAXI-IDLE HIGH       | 3            | 4.80        | 1                         | 16.00                             | 148.50            | 0.10774           |
| RUN-UP               | 4            | 23.70       | 7                         | 34.50                             | 306.00            | 0.11275           |
| TAKE-OFF 100%        | 6            | 255.70      | 85                        | 150.00                            | 1534.50           | 0.09775           |
| CLIMB-RICH           | 8            | 201.60      | 67                        | 117.00                            | 1174.50           | 0.09962           |
| CLIMB-LEAN           | 9            | 204.80      | 68                        | 92.00                             | 1161.00           | 0.07924           |
| APPROACH             | 10           | 35.80       | 11                        | 43.00                             | 387.00            | 0.11111           |
| TAXI-IDLE            | 11           | 4.00        | 1                         | 13.30                             | 126.00            | 0.10556           |
| HOT START            | 13           | 0.0         | 0                         | 8.70                              | 63.00             | 0.13810           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 42500.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 67000.00            | -0.00                         | 36500.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 81000.00            | -0.00                         | 23000.00             | 105.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 76000.00            | -0.00                         | 7500.00              | 125.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 99000.00            | -0.00                         | 2600.00              | 160.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 76000.00            | -0.00                         | 2400.00              | 250.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 1600.00              | 2100.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 116000.00           | -0.00                         | 9500.00              | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 88000.00            | -0.00                         | 42500.00             | 108.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 9000.00             | -0.00                         | 50000.00             | 116.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 442.29                             | 254.41                             | -0.00                               | -0.00                               | 1.21                               | -0.00                               | 4.64                    | 2.67                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 607.60                             | 236.32                             | -0.00                               | -0.00                               | 1.34                               | -0.00                               | 6.87                    | 2.67                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 714.92                             | 145.81                             | -0.00                               | -0.00                               | 1.52                               | -0.00                               | 11.44                   | 2.33                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 642.93                             | 46.02                              | -0.00                               | -0.00                               | 1.74                               | -0.00                               | 22.18                   | 1.59                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 955.17                             | 17.67                              | -0.00                               | -0.00                               | 2.54                               | -0.00                               | 143.28                  | 2.65                    | -0.00                    | -0.00                    | 0.38                    | -0.00                    |
| 8            | 720.93                             | 16.09                              | -0.00                               | -0.00                               | 3.89                               | -0.00                               | 84.34                   | 1.88                    | -0.00                    | -0.00                    | 0.46                    | -0.00                    |
| 9            | 712.77                             | 12.60                              | -0.00                               | -0.00                               | 39.98                              | -0.00                               | 65.58                   | 1.16                    | -0.00                    | -0.00                    | 3.68                    | -0.00                    |
| 10           | 994.87                             | 58.91                              | -0.00                               | -0.00                               | 1.13                               | -0.00                               | 42.78                   | 2.53                    | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 11           | 791.59                             | 273.44                             | -0.00                               | -0.00                               | 1.60                               | -0.00                               | 10.53                   | 3.64                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 13           | 62.54                              | 264.78                             | -0.00                               | -0.00                               | 1.32                               | -0.00                               | 0.54                    | 2.30                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 4.039             | -0.000                 | 1.571              | 0.009             | -0.000                 | 0.009                  |
| 3                                            | 2.383             | -0.000                 | 0.486              | 0.005             | -0.000                 | 0.005                  |
| 4                                            | 0.936             | -0.000                 | 0.067              | 0.003             | -0.000                 | 0.003                  |
| 6                                            | 0.560             | -0.000                 | 0.010              | 0.001             | -0.000                 | 0.001                  |
| 8                                            | 0.418             | -0.000                 | 0.009              | 0.002             | -0.000                 | 0.002                  |
| 9                                            | 0.320             | -0.000                 | 0.006              | 0.018             | -0.000                 | 0.018                  |
| 10                                           | 1.195             | -0.000                 | 0.071              | 0.001             | -0.000                 | 0.001                  |
| 11                                           | 2.632             | -0.000                 | 0.909              | 0.005             | -0.000                 | 0.005                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 16.00                          | 3.20                 | 714.92                 | 11438.64             | 2.288                  | 145.81                 | 2333.00              | 0.467                  | 1.52                   | 24.36                | 0.0049                 |
| 6                       | 0.30                    | 150.00                         | 0.75                 | 955.17                 | 143275.38            | 0.716                  | 17.67                  | 2650.84              | 0.013                  | 2.54                   | 380.34               | 0.0019                 |
| 9                       | 5.00                    | 92.00                          | 7.64                 | 712.77                 | 65575.13             | 5.443                  | 12.60                  | 1159.58              | 0.096                  | 39.98                  | 3677.93              | 0.3053                 |
| 10                      | 6.00                    | 43.00                          | 4.30                 | 994.87                 | 42779.22             | 4.278                  | 58.91                  | 2533.01              | 0.253                  | 1.13                   | 48.46                | 0.0048                 |
| 11                      | 4.00                    | 13.30                          | 0.89                 | 791.59                 | 10528.16             | 0.705                  | 273.44                 | 3636.72              | 0.244                  | 1.60                   | 21.22                | 0.0014                 |
| TOTAL FOR CYCLE         |                         |                                | 16.777               |                        |                      | 13.430                 |                        |                      | 1.073                  |                        |                      | 0.3183                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.801                  |                        |                      | 0.064                  |                        |                      | 0.0190                 |

## O-200-A SUMMARY – CLIMB LEAN MODE

| MODEL SUMMARY           |          | SAMPLE NUMBER = 5.       |                |                  |                |                  |                  |                |                  |                  |                |                  |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
| 3                       | MEAN:    | 9.00                     | 1.80           | 715.79           | 6478.47        | 1.296            | 39.02            | 356.26         | 0.0713           | 0.76             | 6.63           | 0.0013           |
|                         | STD DEV: | 1.06                     | 0.21           | 99.19            | 1336.37        | 0.267            | 15.18            | 149.08         | 0.0298           | 0.25             | 1.42           | 0.0003           |
| 6                       | MEAN:    | 52.16                    | 0.26           | 888.49           | 46350.61       | 0.232            | 13.87            | 723.60         | 0.0036           | 2.94             | 153.24         | 0.0008           |
|                         | STD DEV: | 0.42                     | 0.00           | 34.94            | 2063.94        | 0.010            | 5.68             | 297.64         | 0.0015           | 0.59             | 30.16          | 0.0002           |
| 9                       | MEAN:    | 51.00                    | 4.23           | 884.69           | 45119.34       | 3.745            | 14.10            | 719.33         | 0.0597           | 3.27             | 166.74         | 0.0138           |
|                         | STD DEV: | 0.0                      | 0.01           | 9.10             | 459.29         | 0.038            | 1.49             | 75.90          | 0.0063           | 0.71             | 36.14          | 0.0030           |
| 10                      | MEAN:    | 21.90                    | 2.19           | 472.35           | 10342.84       | 1.034            | 10.33            | 227.46         | 0.0227           | 0.80             | 17.57          | 0.0018           |
|                         | STD DEV: | 0.55                     | 0.05           | 9.06             | 246.97         | 0.025            | 3.08             | 72.48          | 0.0072           | 0.16             | 3.48           | 0.0003           |
| 11                      | MEAN:    | 9.78                     | 0.66           | 601.70           | 5919.19        | 0.397            | 22.31            | 215.52         | 0.0144           | 0.54             | 4.87           | 0.0003           |
|                         | STD DEV: | 2.06                     | 0.14           | 89.29            | 1593.71        | 0.107            | 16.23            | 176.52         | 0.0118           | 0.28             | 1.18           | 0.0001           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 9.139          |                  |                | 6.703            |                  |                | 0.172            |                  |                | 0.0180           |
|                         | STD DEV: |                          | 0.354          |                  |                | 0.339            |                  |                | 0.043            |                  |                | 0.0032           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.733            |                  |                | 0.019            |                  |                | 0.0020           |
|                         |          |                          |                |                  | STD DEV:       | 0.019            |                  |                | 0.004            |                  |                | 0.0004           |

## O-470-R SUMMARY – CLIMB LEAN MODE

| MODEL SUMMARY           |          | SAMPLE NUMBER = 3.       |                |                  |                |                  |                  |                |                  |                  |                |                  |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
| 3                       | MEAN:    | 15.47                    | 3.09           | 769.63           | 11994.62       | 2.399            | 278.11           | 3689.03        | 0.7378           | 1.13             | 14.02          | 0.0036           |
|                         | STD DEV: | 3.72                     | 0.74           | 221.09           | 4385.25        | 0.877            | 143.80           | 2484.66        | 0.4969           | 0.46             | 9.17           | 0.0018           |
| 6                       | MEAN:    | 131.00                   | 0.65           | 1153.09          | 151047.81      | 0.755            | 21.34            | 2797.62        | 0.0140           | 1.11             | 146.31         | 0.0007           |
|                         | STD DEV: | 1.74                     | 0.01           | 9.97             | 1555.87        | 0.008            | 1.39             | 220.13         | 0.0011           | 0.29             | 39.60          | 0.0002           |
| 9                       | MEAN:    | 86.50                    | 7.18           | 593.88           | 51370.54       | 4.264            | 9.17             | 793.47         | 0.0659           | 6.78             | 586.12         | 0.0486           |
|                         | STD DEV: | 0.04                     | 0.01           | 8.57             | 742.23         | 0.062            | 1.23             | 106.49         | 0.0086           | 0.87             | 74.95          | 0.0062           |
| 10                      | MEAN:    | 36.00                    | 3.60           | 441.22           | 27860.27       | 2.286            | 14.45            | 514.24         | 0.0514           | 2.66             | 102.06         | 0.0102           |
|                         | STD DEV: | 5.29                     | 0.53           | 70.25            | 1349.13        | 0.135            | 3.05             | 89.09          | 0.0089           | 1.75             | 81.50          | 0.0082           |
| 11                      | MEAN:    | 15.40                    | 1.03           | 567.40           | 8869.63        | 0.594            | 202.02           | 3454.35        | 0.7314           | 1.11             | 17.84          | 0.0012           |
|                         | STD DEV: | 3.66                     | 0.25           | 56.58            | 2830.70        | 0.190            | 142.17           | 2623.70        | 0.1758           | 0.32             | 8.46           | 0.0006           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 15.560         |                  |                | 10.298           |                  |                | 1.101            |                  |                | 0.0644           |
|                         |          | STD DEV:                 | 1.093          |                  |                | 1.114            |                  |                | 0.675            |                  |                | 0.0120           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.661            |                  |                | 0.069            |                  |                | 0.0041           |
|                         |          |                          |                |                  | STD DEV:       | 0.027            |                  |                | 0.040            |                  |                | 0.0005           |

## IO-520-P SUMMARY – CLIMB LEAN MODE

| MODEL SUMMARY           |          | SAMPLE NUMBER = 5.       |                |                  |                |                  |                  |                |                  |                  |                |                  |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
| 3                       | MEAN:    | 15.80                    | 3.16           | 552.15           | 8739.86        | 1.749            | 138.24           | 2348.11        | 0.4696           | 1.47             | 21.71          | 0.0047           |
|                         | STD DEV: | 1.96                     | 0.39           | 138.81           | 1785.97        | 0.357            | 103.20           | 1887.36        | 0.3775           | 0.50             | 10.21          | 0.0020           |
| 6                       | MEAN:    | 149.20                   | 0.75           | 809.26           | 171043.94      | 0.605            | 16.24            | 2426.70        | 0.0121           | 3.84             | 579.19         | 0.0029           |
|                         | STD DEV: | 4.15                     | 0.02           | 116.76           | 19977.34       | 0.100            | 1.39             | 254.34         | 0.0013           | 1.09             | 148.60         | 0.0007           |
| 9                       | MEAN:    | 92.00                    | 1.64           | 226.45           | 20833.76       | 1.729            | 11.51            | 1058.99        | 0.0879           | 49.26            | 4531.96        | 0.3762           |
|                         | STD DEV: | 0.13                     | 0.01           | 272.03           | 25027.20       | 2.077            | 1.43             | 131.85         | 0.0109           | 7.06             | 649.23         | 0.0539           |
| 10                      | MEAN:    | 41.30                    | 4.13           | 889.97           | 17389.69       | 3.739            | 15.70            | 1511.39        | 0.1511           | 1.28             | 51.71          | 0.0051           |
|                         | STD DEV: | 5.24                     | 0.53           | 153.44           | 10650.04       | 1.065            | 25.55            | 1198.83        | 0.1199           | 0.40             | 11.04          | 0.0011           |
| 11                      | MEAN:    | 13.54                    | 0.71           | 502.07           | 6788.50        | 0.455            | 174.07           | 2415.59        | 0.1618           | 1.19             | 15.40          | 0.0011           |
|                         | STD DEV: | 0.78                     | 0.05           | 162.66           | 2045.45        | 0.140            | 120.25           | 1699.98        | 0.1139           | 0.31             | 3.99           | 0.0003           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 16.592         |                  |                | 8.276            |                  |                | 0.883            |                  |                | 0.3899           |
|                         |          | STD DEV:                 | 0.972          |                  |                | 3.035            |                  |                | 0.531            |                  |                | 0.0539           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.497            |                  |                | 0.052            |                  |                | 0.0237           |
|                         |          |                          |                |                  | STD DEV:       | 0.173            |                  |                | 0.029            |                  |                | 0.0041           |

DATE: 6/18/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 202 ENGINE TYPE AND MODEL: O-200-A

SERIAL NUMBER: 2134578

RATED HORSEPOWER: 100.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.92 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 79.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 4.00                              | 27.00             | 0.14815           |
| TAXI-IDLE LOW        | 2            | 2.10        | 2                         | 5.30                              | 45.00             | 0.11778           |
| TAXI-IDLE HIGH       | 3            | 7.00        | 6                         | 6.30                              | 72.00             | 0.08750           |
| RUN-UP               | 4            | 20.10       | 20                        | 15.00                             | 162.00            | 0.09259           |
| TAKE-OFF 100%        | 6            | 89.60       | 89                        | 52.00                             | 558.00            | 0.09319           |
| CLIMB-RICH           | 8            | 88.30       | 88                        | 50.00                             | 558.00            | 0.08961           |
| CLIMB-LEAN           | 9            | 87.50       | 87                        | 50.00                             | 558.00            | 0.08961           |
| APPROACH             | 10           | 28.00       | 27                        | 23.00                             | 207.00            | 0.11111           |
| TAXI-IDLE            | 11           | 9.30        | 9                         | 10.00                             | 63.00             | 0.15873           |
| HOT START            | 13           | 0.0         | 0                         | 4.00                              | 18.00             | 0.22222           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 84000.00            | -0.00                         | -0.00                | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | -0.00                | 20.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 95000.00            | -0.00                         | -0.00                | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 95000.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 95000.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 349.86                             | -0.00                              | -0.00                               | -0.00                               | 0.27                               | -0.00                               | 1.40                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 438.72                             | -0.00                              | -0.00                               | -0.00                               | 0.13                               | -0.00                               | 2.33                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 681.86                             | -0.00                              | -0.00                               | -0.00                               | 0.17                               | -0.00                               | 4.30                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 4            | 790.68                             | -0.00                              | -0.00                               | -0.00                               | 0.33                               | -0.00                               | 11.86                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 6            | 957.53                             | -0.00                              | -0.00                               | -0.00                               | 0.99                               | -0.00                               | 49.79                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 8            | 991.29                             | -0.00                              | -0.00                               | -0.00                               | 0.94                               | -0.00                               | 49.56                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 9            | 991.29                             | -0.00                              | -0.00                               | -0.00                               | 0.94                               | -0.00                               | 49.56                   | -0.00                   | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 10           | 454.98                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 10.46                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 11           | 416.32                             | -0.00                              | -0.00                               | -0.00                               | 0.25                               | -0.00                               | 4.16                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 224.83                             | -0.00                              | -0.00                               | -0.00                               | 0.27                               | -0.00                               | 0.90                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                | CU<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 1.107             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 3                                           | 0.614             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 4                                           | 0.590             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 6                                           | 0.556             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 8                                           | 0.561             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 9                                           | 0.566             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 10                                          | 0.374             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 11                                          | 0.448             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 6.30                           | 1.26                 | 681.86                 | 4295.69              | 0.859                  | -0.00                  | -0.00                | -0.000                 | 0.17                   | 1.10                 | 0.0002                 |
| 6                       | 0.30                    | 52.00                          | 0.26                 | 957.53                 | 49791.52             | 0.249                  | -0.00                  | -0.00                | -0.000                 | 0.99                   | 51.65                | 0.0003                 |
| 8                       | 5.00                    | 50.00                          | 4.15                 | 991.29                 | 49564.45             | 4.114                  | -0.00                  | -0.00                | -0.000                 | 0.94                   | 47.13                | 0.0039                 |
| 10                      | 6.00                    | 23.00                          | 2.30                 | 454.98                 | 10464.45             | 1.046                  | -0.00                  | -0.00                | -0.000                 | 0.35                   | 8.11                 | 0.0008                 |
| 11                      | 4.00                    | 10.00                          | 0.67                 | 416.32                 | 4163.23              | 0.279                  | -0.00                  | -0.00                | -0.000                 | 0.25                   | 2.48                 | 0.0002                 |
| TOTAL FOR CYCLE         |                         |                                | 8.640                |                        |                      | 6.547                  |                        |                      | -0.000                 |                        |                      | 0.0054                 |
| TOTAL FOR CYCLE/LH FUEL |                         |                                |                      |                        |                      | 0.758                  |                        |                      | -0.000                 |                        |                      | 0.0006                 |

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 204 ENGINE TYPE AND MODEL: Q-200-A SERIAL NUMBER: 213504B  
 RATED HORSEPOWER: 100.  
 ENGINE TOTAL TIME: -0. HRS  
 FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00  
 ATMOSPHERIC PRESSURE: START 28.91 FINISH -0.00  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 65.00  
 RELATIVE HUMIDITY: -0.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
 SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 3.50                              | 27.00             | 0.12963           |
| TAXI-IDLE LOW        | 2            | 2.00        | 1                         | 4.30                              | 36.00             | 0.11944           |
| TAXI-IDLE HIGH       | 3            | 6.80        | 6                         | 7.60                              | 67.50             | 0.11259           |
| RIIN-UP              | 4            | 19.60       | 19                        | 13.20                             | 153.00            | 0.08627           |
| TAKE-OFF 100%        | 6            | 91.10       | 91                        | 53.00                             | 571.50            | 0.09274           |
| CLIMB-RICH           | 8            | 91.10       | 91                        | 53.00                             | 571.50            | 0.09274           |
| CLIMB-LEAN           | 9            | 90.30       | 90                        | 51.00                             | 567.00            | 0.08995           |
| APPROACH             | 10           | 28.80       | 28                        | 22.00                             | 202.50            | 0.10864           |
| TAXI-IDLE            | 11           | 7.00        | 6                         | 6.50                              | 67.50             | 0.09630           |
| HOT START            | 13           | 0.0         | 0                         | 3.50                              | 22.50             | 0.15556           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 82500.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | -0.00                | 10.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 53500.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 6000.00             | -0.00                         | -0.00                | 130.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | -0.00                | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | -0.00                | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 130.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 85000.00            | -0.00                         | -0.00                | 20.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 49500.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | -0.00                | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 612.95                             | -0.00                              | -0.00                               | -0.00                               | 0.31                               | -0.00                               | 2.15                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 2            | 595.16                             | -0.00                              | -0.00                               | -0.00                               | 0.13                               | -0.00                               | 2.56                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 455.08                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 3.46                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 4            | 64.97                              | -0.00                              | -0.00                               | -0.00                               | 2.31                               | -0.00                               | 0.86                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 6            | 649.97                             | -0.00                              | -0.00                               | -0.00                               | 1.50                               | -0.00                               | 34.45                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 8            | 649.97                             | -0.00                              | -0.00                               | -0.00                               | 1.50                               | -0.00                               | 34.45                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 9            | 563.42                             | -0.00                              | -0.00                               | -0.00                               | 2.23                               | -0.00                               | 28.73                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 10           | 747.60                             | -0.00                              | -0.00                               | -0.00                               | 0.29                               | -0.00                               | 16.45                   | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 11           | 486.10                             | -0.00                              | -0.00                               | -0.00                               | 0.49                               | -0.00                               | 3.16                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 13           | 487.23                             | -0.00                              | -0.00                               | -0.00                               | 0.41                               | -0.00                               | 1.69                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 1.240             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 3                                           | 0.509             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 4                                           | 0.044             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 6                                           | 0.378             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 8                                           | 0.378             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 9                                           | 0.318             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 10                                          | 0.571             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| 11                                          | 0.451             | -0.000                 | -0.000             | 0.000             | -0.000                 | 0.000                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>2<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-----------------|--------------------------------|----------------------|------------------------|---------------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00           | 7.60                           | 1.52                 | 455.08                 | 3458.64                   | 0.692                  | -0.00                  | -0.00                | -0.000                 | 0.35                   | 2.65                 | 0.0005                 |
| 6                       | 0.30            | 53.00                          | 0.26                 | 649.97                 | 34448.53                  | 0.172                  | -0.00                  | -0.00                | -0.000                 | 1.50                   | 79.57                | 0.0004                 |
| 8                       | 5.00            | 53.00                          | 4.40                 | 649.97                 | 34448.53                  | 2.859                  | -0.00                  | -0.00                | -0.000                 | 1.50                   | 79.57                | 0.0006                 |
| 10                      | 6.00            | 22.00                          | 2.20                 | 747.60                 | 16447.10                  | 1.645                  | -0.00                  | -0.00                | -0.000                 | 0.29                   | 6.36                 | 0.0006                 |
| 11                      | 4.00            | 6.50                           | 0.44                 | 486.10                 | 3159.68                   | 0.212                  | -0.00                  | -0.00                | -0.000                 | 0.48                   | 3.15                 | 0.0002                 |
| TOTAL FOR CYCLE         |                 |                                | 8.919                |                        |                           | 5.980                  |                        |                      | -0.000                 |                        |                      | 0.0084                 |
| TOTAL FOR CYCLE/LB FUEL |                 |                                |                      |                        |                           | 0.633                  |                        |                      | -0.000                 |                        |                      | 0.0010                 |

NO MODEL SUMMARY CALCULATED

DATE: 6/25/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 217 ENGINE TYPE AND MODEL: D-470-R

SERIAL NUMBER: 211305

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 29.05 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 84.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 15.50                             | 94.50             | 0.16402           |
| TAXI-IDLE LOW        | 2            | 2.00        | 0                         | 18.00                             | 126.00            | 0.14286           |
| TAXI-IDLE HIGH       | 3            | 4.60        | 1                         | 19.70                             | 162.00            | 0.12160           |
| RUN-UP               | 4            | 23.90       | 10                        | 32.00                             | 297.00            | 0.10774           |
| TAKE-OFF 100%        | 6            | 191.10      | 83                        | 133.00                            | 1345.50           | 0.09885           |
| CLIMB-RICH           | 8            | 152.70      | 66                        | 88.00                             | 1044.00           | 0.08429           |
| CLIMB-LEAN           | 9            | 153.80      | 66                        | 86.50                             | 1066.50           | 0.08111           |
| APPROACH             | 10           | 39.00       | 16                        | 34.00                             | 373.50            | 0.09103           |
| TAXI-IDLE            | 11           | 4.30        | 1                         | 17.90                             | 139.50            | 0.12832           |
| HOT START            | 13           | 0.0         | 0                         | 14.50                             | 81.00             | 0.17901           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 64000.00            | -0.00                         | 50000.00             | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 69000.00            | -0.00                         | 50000.00             | 125.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 47500.00             | 100.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 88000.00            | -0.00                         | 4500.00              | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 120000.00           | -0.00                         | 3400.00              | 92.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 1200.00              | 350.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 1000.00              | 415.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 2500.00              | 120.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 83000.00            | -0.00                         | 50000.00             | 115.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 99000.00            | -0.00                         | 50000.00             | 160.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 372.66                             | 233.52                             | -0.00                               | -0.00                               | 1.05                               | -0.00                               | 5.78                    | 3.62                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 2            | 463.31                             | 258.31                             | -0.00                               | -0.00                               | 1.38                               | -0.00                               | 8.34                    | 4.65                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 767.35                             | 275.93                             | -0.00                               | -0.00                               | 1.29                               | -0.00                               | 15.12                   | 5.44                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 4            | 776.52                             | 28.53                              | -0.00                               | -0.00                               | 1.30                               | -0.00                               | 24.85                   | 0.91                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 6            | 1145.91                            | 22.93                              | -0.00                               | -0.00                               | 1.44                               | -0.00                               | 152.41                  | 3.05                    | -0.00                    | -0.00                    | 0.19                    | -0.00                    |
| 8            | 626.54                             | 9.06                               | -0.00                               | -0.00                               | 6.32                               | -0.00                               | 55.14                   | 0.80                    | -0.00                    | -0.00                    | 0.56                    | -0.00                    |
| 9            | 602.12                             | 7.75                               | -0.00                               | -0.00                               | 7.74                               | -0.00                               | 52.08                   | 0.67                    | -0.00                    | -0.00                    | 0.67                    | -0.00                    |
| 10           | 632.14                             | 17.87                              | -0.00                               | -0.00                               | 2.03                               | -0.00                               | 21.49                   | 0.61                    | -0.00                    | -0.00                    | 0.07                    | -0.00                    |
| 11           | 620.06                             | 279.34                             | -0.00                               | -0.00                               | 1.41                               | -0.00                               | 11.10                   | 5.00                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 13           | 575.01                             | 219.09                             | -0.00                               | -0.00                               | 1.39                               | -0.00                               | 7.61                    | 3.18                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 4.170             | -0.000                 | 2.325              | 0.012             | -0.000                 | 0.012                  |
| 3                                           | 3.286             | -0.000                 | 1.182              | 0.006             | -0.000                 | 0.006                  |
| 4                                           | 1.040             | -0.000                 | 0.038              | 0.002             | -0.000                 | 0.002                  |
| 6                                           | 0.798             | -0.000                 | 0.016              | 0.001             | -0.000                 | 0.001                  |
| 8                                           | 0.361             | -0.000                 | 0.005              | 0.004             | -0.000                 | 0.004                  |
| 9                                           | 0.339             | -0.000                 | 0.004              | 0.004             | -0.000                 | 0.004                  |
| 10                                          | 0.551             | -0.000                 | 0.016              | 0.002             | -0.000                 | 0.002                  |
| 11                                          | 2.581             | -0.000                 | 1.163              | 0.006             | -0.000                 | 0.006                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 19.70                          | 3.94                 | 767.35                 | 15116.75             | 3.023                  | 275.93                 | 5435.76              | 1.087                  | 1.29                   | 25.47                | 0.0051                 |
| 6                       | 0.30                    | 133.00                         | 0.66                 | 1145.91                | 152405.88            | 0.762                  | 22.93                  | 3049.29              | 0.015                  | 1.44                   | 191.92               | 0.0010                 |
| 8                       | 5.00                    | 88.00                          | 7.30                 | 626.54                 | 55135.82             | 4.576                  | 9.06                   | 796.89               | 0.066                  | 6.32                   | 556.09               | 0.0462                 |
| 10                      | 6.00                    | 34.00                          | 3.40                 | 632.14                 | 21492.89             | 2.149                  | 17.87                  | 607.69               | 0.061                  | 2.03                   | 68.88                | 0.0069                 |
| 11                      | 4.00                    | 17.90                          | 1.20                 | 620.06                 | 11099.14             | 0.744                  | 279.34                 | 5000.11              | 0.335                  | 1.41                   | 25.26                | 0.0017                 |
| TOTAL FOR CYCLE         |                         |                                | 16.508               |                        |                      | 11.255                 |                        |                      | 1.564                  |                        |                      | 0.0608                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.682                  |                        |                      | 0.095                  |                        |                      | 0.0037                 |

DATE: 6/20/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 218 ENGINE TYPE AND MODEL: Q-470-R

SERIAL NUMBER: 211302A

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.53 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 109.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 15.40                             | 99.00             | 0.15556           |
| TAXI-IDLE LOW        | 2            | 1.50        | 0                         | 16.70                             | 117.00            | 0.14274           |
| TAXI-IDLE HIGH       | 3            | 4.20        | 1                         | 14.00                             | 153.00            | 0.09150           |
| RUN-UP               | 4            | 23.10       | 10                        | 33.00                             | 301.50            | 0.10945           |
| TAKF-OFF 100%        | 6            | 158.70      | 68                        | 130.00                            | 1323.00           | 0.09826           |
| CLIMB-RICH           | 8            | 155.30      | 67                        | 90.00                             | 1012.50           | 0.08889           |
| CLIMB-LEAN           | 9            | 156.80      | 68                        | 86.50                             | 1035.00           | 0.08357           |
| APPROACH             | 10           | 52.60       | 22                        | 42.00                             | 495.00            | 0.08485           |
| TAXI-IDLE            | 11           | 4.00        | 1                         | 17.10                             | 139.50            | 0.12258           |
| HOT START            | 13           | 0.0         | 0                         | 15.50                             | 103.50            | 0.14976           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 76500.00            | -0.00                         | 50000.00             | 120.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 50000.00             | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 48000.00             | 89.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 110000.00           | -0.00                         | 5000.00              | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 3000.00              | 62.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 1500.00              | 265.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 1300.00              | 360.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 1600.00              | 260.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 50000.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 59000.00            | -0.00                         | 50000.00             | 122.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 468.01                             | 247.74                             | -0.00                               | -0.00                               | 1.21                               | -0.00                               | 7.21                    | 3.74                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 2            | 521.10                             | 258.48                             | -0.00                               | -0.00                               | 1.21                               | -0.00                               | 8.70                    | 4.32                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 991.86                             | 341.91                             | -0.00                               | -0.00                               | 1.49                               | -0.00                               | 13.89                   | 4.79                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 950.98                             | 31.34                              | -0.00                               | -0.00                               | 0.71                               | -0.00                               | 31.38                   | 1.03                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 6            | 1164.52                            | 20.32                              | -0.00                               | -0.00                               | 0.97                               | -0.00                               | 151.39                  | 2.64                    | -0.00                    | -0.00                    | 0.13                    | -0.00                    |
| 8            | 641.80                             | 10.91                              | -0.00                               | -0.00                               | 4.54                               | -0.00                               | 57.76                   | 0.98                    | -0.00                    | -0.00                    | 0.41                    | -0.00                    |
| 9            | 594.51                             | 9.87                               | -0.00                               | -0.00                               | 6.51                               | -0.00                               | 51.43                   | 0.85                    | -0.00                    | -0.00                    | 0.56                    | -0.00                    |
| 10           | 575.44                             | 12.02                              | -0.00                               | -0.00                               | 4.64                               | -0.00                               | 24.19                   | 0.50                    | -0.00                    | -0.00                    | 0.19                    | -0.00                    |
| 11           | 574.55                             | 288.77                             | -0.00                               | -0.00                               | 1.15                               | -0.00                               | 9.82                    | 4.94                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 13           | 375.37                             | 249.57                             | -0.00                               | -0.00                               | 1.27                               | -0.00                               | 5.87                    | 3.87                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 5.802             | -0.000                 | 2.878              | 0.013             | -0.000                 | 0.013                  |
| 3                                            | 3.306             | -0.000                 | 1.140              | 0.005             | -0.000                 | 0.005                  |
| 4                                            | 1.359             | -0.000                 | 0.045              | 0.001             | -0.000                 | 0.001                  |
| 6                                            | 0.954             | -0.000                 | 0.017              | 0.001             | -0.000                 | 0.001                  |
| 8                                            | 0.372             | -0.000                 | 0.006              | 0.003             | -0.000                 | 0.003                  |
| 9                                            | 0.328             | -0.000                 | 0.005              | 0.004             | -0.000                 | 0.004                  |
| 10                                           | 0.460             | -0.000                 | 0.010              | 0.004             | -0.000                 | 0.004                  |
| 11                                           | 2.456             | -0.000                 | 1.234              | 0.005             | -0.000                 | 0.005                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>2<br>LB/IK<br>HOURS | THC<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|---------------------------|-------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 14.00                          | 2.80                 | 991.86                 | 13886.05                  | 2.777                   | 341.91                 | 4786.76              | 0.957                  | 1.49                   | 20.62                | 0.0042                 |
| 6                       | 0.30                    | 130.00                         | 0.65                 | 1164.52                | 151388.06                 | 0.757                   | 20.32                  | 2641.04              | 0.013                  | 0.97                   | 126.37               | 0.0006                 |
| 8                       | 5.00                    | 90.00                          | 7.47                 | 641.80                 | 57762.31                  | 4.794                   | 981.49                 | 981.49               | 0.081                  | 4.54                   | 408.82               | 0.0339                 |
| 10                      | 6.00                    | 42.00                          | 4.20                 | 575.94                 | 24189.44                  | 2.419                   | 12.02                  | 504.78               | 0.050                  | 4.64                   | 194.92               | 0.0195                 |
| 11                      | 4.00                    | 17.10                          | 1.15                 | 574.55                 | 9824.86                   | 0.654                   | 289.77                 | 4937.97              | 0.331                  | 1.15                   | 19.63                | 0.0013                 |
| TOTAL FOR CYCLE         |                         |                                | 16.266               |                        |                           | 11.406                  |                        |                      | 1.433                  |                        |                      | 0.0595                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                           | 0.701                   |                        |                      | 0.088                  |                        |                      | 0.0037                 |

DATE: 6/28/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 219 ENGINE TYPE AND MODEL: D-470-R

SERIAL NUMBER: 470-R-2113028

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 80/87

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.58 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 114.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 11

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 8.50                              | 81.00             | 0.10494           |
| TAXI-IDLE LOW        | 2            | 1.60        | 0                         | 8.80                              | 81.00             | 0.10864           |
| TAXI-IDLE HIGH       | 3            | 4.00        | 1                         | 12.70                             | 126.00            | 0.10079           |
| RUN-UP               | 4            | 22.00       | 9                         | 22.00                             | 252.00            | 0.08730           |
| TAKE-OFF 100%        | 6            | 186.30      | 80                        | 130.00                            | 1305.00           | 0.09962           |
| TAKE-OFF TO CLIMB    | 7            | 152.90      | 66                        | 91.00                             | 1026.00           | 0.08869           |
| CLIMB-RICH           | 8            | 150.60      | 65                        | 74.00                             | 999.00            | 0.07407           |
| CLIMB-LEAN           | 9            | 154.00      | 66                        | 86.50                             | 1039.50           | 0.08321           |
| APPROACH             | 10           | 37.00       | 16                        | 32.00                             | 346.50            | 0.09235           |
| TAXI-IDLE            | 11           | 4.40        | 1                         | 11.20                             | 117.00            | 0.09573           |
| HOT START            | 13           | 0.0         | 0                         | 8.50                              | 72.00             | 0.11806           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGR F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|----------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                            | -0.00                              | 52000.00            | -0.00                         | 20000.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                            | -0.00                              | 52000.00            | -0.00                         | 20000.00             | 45.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                            | -0.00                              | 59000.00            | -0.00                         | 10000.00             | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                            | -0.00                              | 59000.00            | -0.00                         | 2200.00              | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                            | -0.00                              | 122000.00           | -0.00                         | 3100.00              | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 7            | -0.00                            | -0.00                              | 64000.00            | -0.00                         | 1500.00              | 220.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                            | -0.00                              | 73000.00            | -0.00                         | 1000.00              | 1050.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                            | -0.00                              | 53000.00            | -0.00                         | 1300.00              | 335.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                            | -0.00                              | 71000.00            | -0.00                         | 1900.00              | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                            | -0.00                              | 52000.00            | -0.00                         | 5500.00              | 48.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                            | -0.00                              | 52000.00            | -0.00                         | 2900.00              | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 466.92                             | 129.22                             | -0.00                               | -0.00                               | 0.88                               | -0.00                               | 3.97                    | 1.10                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 452.16                             | 126.04                             | -0.00                               | -0.00                               | 0.64                               | -0.00                               | 3.98                    | 1.11                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 3            | 549.69                             | 66.50                              | -0.00                               | -0.00                               | 0.61                               | -0.00                               | 6.98                    | 0.84                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 624.77                             | 16.20                              | -0.00                               | -0.00                               | 1.57                               | -0.00                               | 13.74                   | 0.36                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 6            | 1148.84                            | 20.79                              | -0.00                               | -0.00                               | 0.93                               | -0.00                               | 149.35                  | 2.70                    | -0.00                    | -0.00                    | 0.12                    | -0.00                    |
| 7            | 668.41                             | 10.92                              | -0.00                               | -0.00                               | 3.77                               | -0.00                               | 60.83                   | 0.99                    | -0.00                    | -0.00                    | 0.34                    | -0.00                    |
| 8            | 888.81                             | 8.25                               | -0.00                               | -0.00                               | 21.00                              | -0.00                               | 65.77                   | 0.61                    | -0.00                    | -0.00                    | 1.55                    | -0.00                    |
| 9            | 585.01                             | 9.90                               | -0.00                               | -0.00                               | 6.07                               | -0.00                               | 50.60                   | 0.86                    | -0.00                    | -0.00                    | 0.53                    | -0.00                    |
| 10           | 715.57                             | 13.45                              | -0.00                               | -0.00                               | 1.32                               | -0.00                               | 22.90                   | 0.43                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 11           | 507.58                             | 37.94                              | -0.00                               | -0.00                               | 0.77                               | -0.00                               | 5.68                    | 0.42                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 418.09                             | 17.21                              | -0.00                               | -0.00                               | 0.53                               | -0.00                               | 3.55                    | 0.15                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                      |                           |                       |                      |                           |                           |
| 2                                            | 2.487                | -0.000                    | 0.693                 | 0.004                | -0.000                    | 0.004                     |
| 3                                            | 1.745                | -0.000                    | 0.211                 | 0.002                | -0.000                    | 0.002                     |
| 4                                            | 0.625                | -0.000                    | 0.016                 | 0.002                | -0.000                    | 0.002                     |
| 6                                            | 0.802                | -0.000                    | 0.015                 | 0.001                | -0.000                    | 0.001                     |
| 7                                            | 0.398                | -0.000                    | 0.007                 | 0.002                | -0.000                    | 0.002                     |
| 8                                            | 0.437                | -0.000                    | 0.004                 | 0.010                | -0.000                    | 0.010                     |
| 9                                            | 0.329                | -0.000                    | 0.006                 | 0.003                | -0.000                    | 0.003                     |
| 10                                           | 0.619                | -0.000                    | 0.012                 | 0.001                | -0.000                    | 0.001                     |
| 11                                           | 1.292                | -0.000                    | 0.097                 | 0.002                | -0.000                    | 0.002                     |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                      |                           |                       |                      |                           |                           |

## LTO CYCLE EMISSIONS

| TEST<br>MODE | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|--------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3            | 12.00                   | 12.70                          | 2.54                 | 549.69                 | 6981.07              | 1.396                  | 66.50                  | 844.56               | 0.169                  | 0.61                   | 7.77                 | 0.0016                 |
| 6            | 0.30                    | 130.00                         | 0.65                 | 1148.84                | 149349.50            | 0.747                  | 20.79                  | 2702.54              | 0.014                  | 0.93                   | 120.65               | 0.0006                 |
| 8            | 5.00                    | 74.00                          | 6.14                 | 888.81                 | 65771.75             | 5.459                  | 8.25                   | 610.64               | 0.051                  | 21.00                  | 1553.91              | 0.1290                 |
| 10           | 6.00                    | 32.00                          | 3.20                 | 715.57                 | 22898.30             | 2.290                  | 13.45                  | 430.27               | 0.043                  | 1.32                   | 42.38                | 0.0042                 |
| 11           | 4.00                    | 11.20                          | 0.75                 | 507.58                 | 5684.90              | 0.381                  | 37.94                  | 424.98               | 0.028                  | 0.77                   | 8.62                 | 0.0006                 |

TOTAL FOR CYCLE

13.282

10.273

0.305

0.1359

TOTAL FOR CYCLE/LB FUEL

0.773

0.023

0.0102

DATE: 6/29/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 221 ENGINE TYPE AND MODEL: O-470-R

SERIAL NUMBER: 470-R-3113028

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87

FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.77 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 103.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLO START + 130 SEC | 1            | 0.0         | 0                         | 9.80                              | 81.00             | 0.12099           |
| TAXI-IDLE LOW        | 2            | 1.90        | 0                         | 10.70                             | 94.50             | 0.11323           |
| TAXI-IDLE HIGH       | 3            | 4.90        | 2                         | 14.10                             | 126.00            | 0.11190           |
| RUN-UP               | 4            | 24.00       | 10                        | 30.00                             | 283.50            | 0.10582           |
| TAKE-OFF 100%        | 6            | 193.60      | 84                        | 132.00                            | 1341.00           | 0.09843           |
| CLIMB-RICH           | 8            | 158.00      | 68                        | 90.00                             | 1039.50           | 0.08658           |
| APPROACH             | 10           | 38.90       | 16                        | 33.00                             | 360.00            | 0.09167           |
| TAXI-IDLE            | 11           | 5.00        | 2                         | 14.80                             | 117.00            | 0.12650           |
| HOT START            | 13           | 1.40        | 0                         | 8.90                              | 76.50             | 0.11634           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 32500.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 71000.00            | -0.00                         | 30000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 13220.00             | 50.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 3300.00              | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 2600.00              | 70.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 1300.00              | 320.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 1900.00              | 100.50              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 71000.00            | -0.00                         | 12000.00             | 40.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 37500.00             | 70.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>THC<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 484.23                             | 184.49                             | -0.00                               | -0.00                               | 0.78                                | -0.00                               | 4.75                    | 1.86                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 595.44                             | 183.51                             | -0.00                               | -0.00                               | 0.76                                | -0.00                               | 6.37                    | 1.96                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 3            | 661.42                             | 81.55                              | -0.00                               | -0.00                               | 0.70                                | -0.00                               | 9.33                    | 1.15                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 696.77                             | 21.19                              | -0.00                               | -0.00                               | 0.88                                | -0.00                               | 20.90                   | 0.64                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 6            | 1164.10                            | 17.58                              | -0.00                               | -0.00                               | 1.10                                | -0.00                               | 153.69                  | 2.32                    | -0.00                    | -0.00                    | 0.14                    | -0.00                    |
| 8            | 609.50                             | 9.63                               | -0.00                               | -0.00                               | 5.62                                | -0.00                               | 54.86                   | 0.87                    | -0.00                    | -0.00                    | 0.51                    | -0.00                    |
| 10           | 549.23                             | 13.52                              | -0.00                               | -0.00                               | 1.68                                | -0.00                               | 18.12                   | 0.45                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 11           | 515.46                             | 67.74                              | -0.00                               | -0.00                               | 0.50                                | -0.00                               | 7.92                    | 1.00                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 465.32                             | 224.93                             | -0.00                               | -0.00                               | 0.94                                | -0.00                               | 4.15                    | 2.00                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                              | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|-------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                         | 3.353             | -0.000                 | 1.033              | 0.004             | -0.000                 | 0.004                  |
| 3                                         | 1.903             | -0.000                 | 0.235              | 0.002             | -0.000                 | 0.002                  |
| 4                                         | 0.871             | -0.000                 | 0.026              | 0.001             | -0.000                 | 0.001                  |
| 6                                         | 0.794             | -0.000                 | 0.017              | 0.001             | -0.000                 | 0.001                  |
| 8                                         | 0.347             | -0.000                 | 0.005              | 0.003             | -0.000                 | 0.003                  |
| 10                                        | 0.466             | -0.000                 | 0.011              | 0.001             | -0.000                 | 0.001                  |
| 11                                        | 1.585             | -0.000                 | 0.201              | 0.001             | -0.000                 | 0.001                  |
| 13                                        | 2.962             | -0.000                 | 1.430              | 0.006             | -0.000                 | 0.006                  |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USFD<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 14.10                          | 2.82                 | 661.42                 | 9325.96              | 1.865                  | 81.55                  | 1149.92              | 0.230                  | 0.70                   | 9.62                 | 0.0020                 |
| 6                       | 0.30                    | 132.00                         | 0.66                 | 1164.30                | 153686.94            | 0.764                  | 17.58                  | 2321.21              | 0.012                  | 1.10                   | 144.84               | 0.0007                 |
| 8                       | 5.00                    | 90.00                          | 7.47                 | 609.50                 | 54855.38             | 4.553                  | 9.63                   | 866.50               | 0.012                  | 5.62                   | 505.84               | 0.0420                 |
| 10                      | 6.00                    | 33.00                          | 3.30                 | 549.21                 | 18124.65             | 1.812                  | 13.52                  | 446.06               | 0.045                  | 1.68                   | 55.41                | 0.0055                 |
| 11                      | 4.00                    | 14.80                          | 0.49                 | 535.46                 | 7924.86              | 0.531                  | 67.74                  | 1002.56              | 0.067                  | 0.50                   | 7.33                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 15.242               |                        |                      | 9.530                  |                        |                      | 0.425                  |                        |                      | 0.0507                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.625                  |                        |                      | 0.028                  |                        |                      | 0.0033                 |

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 210 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 199950A

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.96 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 10.60                             | 81.00             | 0.13086           |
| TAXI-IDLE LOW        | 2            | 1.90        | 0                         | 11.00                             | 85.50             | 0.12865           |
| TAXI-IDLE HIGH       | 3            | 4.60        | 1                         | 16.00                             | 130.50            | 0.12261           |
| RUN-UP               | 4            | 24.00       | 7                         | 36.00                             | 306.00            | 0.11765           |
| TAKE-OFF 100%        | 6            | 263.70      | 87                        | 145.00                            | 1566.00           | 0.09259           |
| CLIMB-RICH           | 8            | 202.10      | 67                        | 110.00                            | 1188.00           | 0.09259           |
| CLIMB-LEAN           | 9            | 202.90      | 67                        | 92.00                             | 1183.50           | 0.07774           |
| APPROACH             | 10           | 35.40       | 11                        | 45.00                             | 378.00            | 0.11905           |
| TAXI-IDLE            | 11           | 4.60        | 1                         | 16.00                             | 117.00            | 0.13675           |
| HOT START            | 13           | 0.0         | 0                         | 10.50                             | 81.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(CRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 74000.00            | -0.00                         | -0.00                | 47.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | -0.00                | 460.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | -0.00                | 470.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 10000.00            | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 81000.00            | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 30.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 81000.00            | -0.00                         | -0.00                | 25.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 544.96                             | -0.00                              | -0.00                               | -0.00                               | 0.57                               | -0.00                               | 5.78                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 516.70                             | -0.00                              | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 5.68                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 462.98                             | -0.00                              | -0.00                               | -0.00                               | 0.32                               | -0.00                               | 7.41                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 440.84                             | -0.00                              | -0.00                               | -0.00                               | 0.40                               | -0.00                               | 15.87                   | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 6            | 625.75                             | -0.00                              | -0.00                               | -0.00                               | 7.69                               | -0.00                               | 90.73                   | -0.00                   | -0.00                    | -0.00                    | 1.11                    | -0.00                    |
| 8            | 625.75                             | -0.00                              | -0.00                               | -0.00                               | 7.85                               | -0.00                               | 68.83                   | -0.00                   | -0.00                    | -0.00                    | 0.86                    | -0.00                    |
| 9            | 118.33                             | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | 10.89                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 10           | 653.84                             | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | 29.42                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 11           | 415.98                             | -0.00                              | -0.00                               | -0.00                               | 0.35                               | -0.00                               | 6.66                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 602.09                             | -0.00                              | -0.00                               | -0.00                               | 0.31                               | -0.00                               | 6.32                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 2.991             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 3                                            | 1.610             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 4                                            | 0.661             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 6                                            | 0.344             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 8                                            | 0.341             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 9                                            | 0.054             | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 10                                           | 0.831             | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 11                                           | 1.447             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 16.00                          | 3.20                 | 462.98                 | 7407.62              | 1.482                  | -0.00                  | -0.00                | -0.000                 | 0.32                   | 5.16                 | 0.0010                 |
| 6                       | 0.30                    | 145.00                         | 0.72                 | 625.75                 | 90733.19             | 0.454                  | -0.00                  | -0.00                | -0.000                 | 7.69                   | 1114.73              | 0.0056                 |
| 8                       | 5.00                    | 110.00                         | 9.13                 | 625.75                 | 68832.06             | 5.713                  | -0.00                  | -0.00                | -0.000                 | 7.85                   | 864.04               | 0.0717                 |
| 10                      | 6.00                    | 45.00                          | 4.50                 | 653.84                 | 29422.80             | 2.942                  | -0.00                  | -0.00                | -0.000                 | -0.00                  | -0.00                | -0.0000                |
| 11                      | 4.00                    | 16.00                          | 1.07                 | 415.98                 | 6655.64              | 0.446                  | -0.00                  | -0.00                | -0.000                 | 0.35                   | 5.56                 | 0.0004                 |
| TOTAL FOR CYCLE         |                         |                                | 18.627               |                        |                      | 11.036                 |                        |                      | -0.000                 |                        |                      | -0.0000                |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.592                  |                        |                      | -0.000                 |                        |                      | -0.0000                |

DATE: 6/21/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 211 ENGINE TYPE AND MODEL: 10-520-P

SERIAL NUMBER: 159850B

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.96 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATE | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|--------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                        | 10.80                             | 81.00             | 0.13333           |
| TAXI-IDLE LOW        | 2            | 1.90        | 0                        | 12.30                             | 85.50             | 0.14386           |
| TAXI-IDLE HIGH       | 3            | 4.80        | 1                        | 15.20                             | 121.50            | 0.12510           |
| RUN-UP               | 4            | 24.20       | 8                        | 37.00                             | 310.50            | 0.11916           |
| TAKE-OFF 100%        | 6            | 264.20      | 88                       | 145.00                            | 1633.50           | 0.08877           |
| CLIMB-RICH           | 8            | 202.30      | 67                       | 111.00                            | 1197.00           | 0.09273           |
| CLIMB-LFAN           | 9            | 203.30      | 67                       | 92.00                             | 1192.50           | 0.07715           |
| APPROACH             | 10           | 35.80       | 11                       | 48.00                             | 369.00            | 0.13008           |
| TAXI-IDLE            | 11           | 4.50        | 1                        | 14.50                             | 112.50            | 0.12889           |
| HOT START            | 13           | 0.0         | 0                        | 10.50                             | 81.00             | 0.12963           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 76500.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 69000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 62000.00            | -0.00                         | -0.00                | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | -0.00                | 47.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | -0.00                | 410.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 410.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8000.00             | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 62000.00            | -0.00                         | -0.00                | 35.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 59000.00            | -0.00                         | -0.00                | 42.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 78000.00            | -0.00                         | -0.00                | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 553.09                             | -0.00                              | -0.00                               | -0.00                               | 0.65                               | -0.00                               | 5.97                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 462.35                             | -0.00                              | -0.00                               | -0.00                               | 0.39                               | -0.00                               | 5.69                    | -0.00                   | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 3            | 477.12                             | -0.00                              | -0.00                               | -0.00                               | 0.53                               | -0.00                               | 7.25                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 419.36                             | -0.00                              | -0.00                               | -0.00                               | 0.62                               | -0.00                               | 15.52                   | -0.00                   | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 6            | 570.25                             | -0.00                              | -0.00                               | -0.00                               | 7.11                               | -0.00                               | 82.69                   | -0.00                   | -0.00                    | -0.00                    | 1.03                    | -0.00                    |
| 8            | 599.51                             | -0.00                              | -0.00                               | -0.00                               | 6.84                               | -0.00                               | 66.55                   | -0.00                   | -0.00                    | -0.00                    | 0.76                    | -0.00                    |
| 9            | 95.27                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | 8.76                    | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 10           | 459.29                             | -0.00                              | -0.00                               | -0.00                               | 0.43                               | -0.00                               | 22.05                   | -0.00                   | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 11           | 441.03                             | -0.00                              | -0.00                               | -0.00                               | 0.52                               | -0.00                               | 6.39                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 579.19                             | -0.00                              | -0.00                               | -0.00                               | 0.67                               | -0.00                               | 6.09                    | -0.00                   | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 2.993             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 3                                           | 1.511             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| 4                                           | 0.641             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 6                                           | 0.313             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 8                                           | 0.329             | -0.000                 | -0.000             | 0.004             | -0.000                 | 0.004                  |
| 9                                           | 0.043             | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 10                                          | 0.616             | -0.000                 | -0.000             | 0.001             | -0.000                 | 0.001                  |
| 11                                          | 1.421             | -0.000                 | -0.000             | 0.002             | -0.000                 | 0.002                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 15.20                          | 3.04                 | 477.12                 | 7252.21              | 1.450                  | -0.00                  | -0.00                | -0.000                 | 0.53                   | 8.07                 | 0.0016                 |
| 6                       | 0.30                    | 145.00                         | 0.72                 | 570.25                 | 82686.63             | 0.413                  | -0.00                  | -0.00                | -0.000                 | 7.11                   | 1031.21              | 0.0052                 |
| 8                       | 5.00                    | 111.00                         | 9.21                 | 599.51                 | 66545.63             | 5.523                  | -0.00                  | -0.00                | -0.000                 | 6.84                   | 759.58               | 0.0630                 |
| 10                      | 6.00                    | 48.00                          | 4.80                 | 459.29                 | 22045.99             | 2.205                  | -0.00                  | -0.00                | -0.000                 | 0.43                   | 20.44                | 0.0020                 |
| 11                      | 4.00                    | 14.50                          | 0.97                 | 441.03                 | 6394.95              | 0.428                  | -0.00                  | -0.00                | -0.000                 | 0.52                   | 7.48                 | 0.0005                 |
| TOTAL FOR CYCLE         |                         |                                | 18.749               |                        |                      | 10.020                 |                        |                      | -0.000                 |                        |                      | 0.0724                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.534                  |                        |                      | -0.000                 |                        |                      | 0.0039                 |

DATE: 6/22/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 212 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 159977A

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.94 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 9

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLO START + 130 SEC | 1            | 0.0         | 0                         | 11.50                             | 81.00             | 0.14198           |
| TAXI-IDLE HIGH       | 3            | 4.60        | 1                         | 18.10                             | 144.00            | 0.12569           |
| RUN-UP               | 4            | 23.60       | 7                         | 39.00                             | 315.00            | 0.12381           |
| TAKE-OFF 100%        | 6            | 261.40      | 87                        | 154.00                            | 1597.50           | 0.09640           |
| CLIMB-RICH           | 8            | 200.00      | 66                        | 123.00                            | 1192.50           | 0.10314           |
| CLIMB-LEAN           | 9            | 204.80      | 68                        | 92.00                             | 1183.50           | 0.07774           |
| APPROACH             | 10           | 37.30       | 12                        | 46.00                             | 396.00            | 0.11616           |
| TAXI-IDLE            | 11           | 4.20        | 1                         | 14.60                             | 117.00            | 0.12479           |
| HOT START            | 13           | 0.0         | 0                         | 8.10                              | 67.50             | 0.12000           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 87500.00            | -0.00                         | 47500.00             | 145.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 42500.00             | 177.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 116000.00           | -0.00                         | 9000.00              | 125.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 87500.00            | -0.00                         | 2400.00              | 205.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 97500.00            | -0.00                         | 2400.00              | 175.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 9000.00             | -0.00                         | 1300.00              | 2250.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 11000.00             | 55.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 37500.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 73500.00            | -0.00                         | 45000.00             | 60.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 594.18                             | 246.51                             | -0.00                               | -0.00                               | 1.62                               | -0.00                               | 6.83                    | 2.83                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 398.34                             | 241.02                             | -0.00                               | -0.00                               | 2.23                               | -0.00                               | 7.21                    | 4.36                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 4            | 901.71                             | 51.60                              | -0.00                               | -0.00                               | 1.60                               | -0.00                               | 35.17                   | 2.01                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 858.84                             | 16.48                              | -0.00                               | -0.00                               | 3.31                               | -0.00                               | 132.26                  | 2.54                    | -0.00                    | -0.00                    | 0.51                    | -0.00                    |
| 8            | 900.07                             | 15.70                              | -0.00                               | -0.00                               | 2.65                               | -0.00                               | 110.71                  | 1.93                    | -0.00                    | -0.00                    | 0.33                    | -0.00                    |
| 9            | 106.50                             | 10.38                              | -0.00                               | -0.00                               | 43.73                              | -0.00                               | 9.80                    | 0.95                    | -0.00                    | -0.00                    | 4.02                    | -0.00                    |
| 10           | 1008.09                            | 66.05                              | -0.00                               | -0.00                               | 0.75                               | -0.00                               | 46.37                   | 3.04                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 11           | 416.58                             | 213.79                             | -0.00                               | -0.00                               | 0.76                               | -0.00                               | 6.08                    | 3.12                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 588.79                             | 263.93                             | -0.00                               | -0.00                               | 0.79                               | -0.00                               | 4.77                    | 2.14                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 3                                            | 1.567             | -0.000                 | 0.948              | 0.009             | -0.000                 | 0.009                  |
| 4                                            | 1.490             | -0.000                 | 0.085              | 0.003             | -0.000                 | 0.003                  |
| 6                                            | 0.506             | -0.000                 | 0.010              | 0.002             | -0.000                 | 0.002                  |
| 8                                            | 0.554             | -0.000                 | 0.010              | 0.002             | -0.000                 | 0.002                  |
| 9                                            | 0.048             | -0.000                 | 0.005              | 0.020             | -0.000                 | 0.020                  |
| 10                                           | 1.243             | -0.000                 | 0.081              | 0.001             | -0.000                 | 0.001                  |
| 11                                           | 1.448             | -0.000                 | 0.743              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 18.10                          | 3.62                 | 398.34                 | 7209.88              | 1.442                  | 241.02                 | 4362.54              | 0.873                  | 2.23                   | 40.31                | 0.0081                 |
| 6                       | 0.30                    | 154.00                         | 0.77                 | 858.84                 | 132261.56            | 0.661                  | 16.48                  | 2537.19              | 0.013                  | 3.31                   | 508.98               | 0.0025                 |
| 8                       | 5.00                    | 123.00                         | 10.21                | 900.07                 | 110708.69            | 9.189                  | 15.70                  | 1930.99              | 0.160                  | 2.65                   | 326.39               | 0.0271                 |
| 10                      | 6.00                    | 46.00                          | 4.60                 | 1008.09                | 46372.05             | 4.637                  | 66.05                  | 3038.48              | 0.304                  | 0.75                   | 34.34                | 0.0034                 |
| 11                      | 4.00                    | 14.60                          | 0.98                 | 416.58                 | 6082.04              | 0.407                  | 213.79                 | 3121.36              | 0.209                  | 0.76                   | 11.10                | 0.0007                 |
| TOTAL FOR CYCLE         |                         |                                | 20.177               |                        |                      | 16.337                 |                        |                      | 1.558                  |                        |                      | 0.0419                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.810                  |                        |                      | 0.077                  |                        |                      | 0.0021                 |

DATE: 6/22/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 213 ENGINE TYPE AND MODEL: 1D-520-P

SERIAL NUMBER: 1599778

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL M/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.94 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 63.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 9.60                              | 76.50             | 0.12549           |
| TAXI-IDLE LOW        | 2            | 2.60        | 0                         | 10.50                             | 81.00             | 0.12963           |
| TAXI-IDLE HIGH       | 3            | 6.10        | 2                         | 17.20                             | 135.00            | 0.12741           |
| RUN-UP               | 4            | 26.60       | 8                         | 37.00                             | 315.00            | 0.11746           |
| TAKE-OFF 100%        | 6            | 262.80      | 87                        | 152.00                            | 1548.00           | 0.09819           |
| CLIMB-RICH           | 8            | 206.20      | 68                        | 123.00                            | 1206.00           | 0.10199           |
| CLIMB-LEAN           | 9            | 209.20      | 69                        | 92.00                             | 1188.00           | 0.07744           |
| APPROACH             | 10           | 40.00       | 13                        | 46.00                             | 391.50            | 0.11750           |
| TAXI-IDLE            | 11           | 5.70        | 1                         | 14.20                             | 117.00            | 0.12137           |
| HOT START            | 13           | 0.0         | 0                         | 10.00                             | 67.50             | 0.14815           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 9500.00             | -0.00                         | 50000.00             | 295.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 64500.00            | -0.00                         | 50000.00             | 112.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 59000.00            | -0.00                         | 42500.00             | 95.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 117000.00           | -0.00                         | 9500.00              | 68.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 89000.00            | -0.00                         | 2500.00              | 215.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 92500.00            | -0.00                         | 2300.00              | 190.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8300.00             | -0.00                         | 1200.00              | 2825.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 1100.00              | 87.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 50000.00             | 100.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 74000.00            | -0.00                         | 59000.00             | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS FMI<br>CO<br>LB/IK<br>LB FUEL | MASS FMI<br>HC<br>LB/IK<br>LB FUEL | MASS FMI<br>NO2<br>LB/IK<br>LB FUEL | MASS FMI<br>CO2<br>LB/IK<br>LB FUEL | MASS FMI<br>NO<br>LB/IK<br>LB FUEL | MASS FMI<br>NOX<br>LB/IK<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 72.89                              | 283.89                             | -0.00                               | -0.00                               | 3.72                               | -0.00                               | 0.70                    | 2.73                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 2            | 628.11                             | 277.27                             | -0.00                               | -0.00                               | 1.37                               | -0.00                               | 6.60                    | 2.91                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 3            | 446.04                             | 238.66                             | -0.00                               | -0.00                               | 1.06                               | -0.00                               | 7.67                    | 4.11                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 956.61                             | 56.59                              | -0.00                               | -0.00                               | 0.91                               | -0.00                               | 35.39                   | 2.09                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 6            | 949.56                             | 16.94                              | -0.00                               | -0.00                               | 3.41                               | -0.00                               | 129.13                  | 2.57                    | -0.00                    | -0.00                    | 0.52                    | -0.00                    |
| 8            | 862.75                             | 15.17                              | -0.00                               | -0.00                               | 2.91                               | -0.00                               | 106.12                  | 1.87                    | -0.00                    | -0.00                    | 0.36                    | -0.00                    |
| 9            | 98.53                              | 9.60                               | -0.00                               | -0.00                               | 55.08                              | -0.00                               | 9.06                    | 0.88                    | -0.00                    | -0.00                    | 5.07                    | -0.00                    |
| 10           | 997.19                             | 6.55                               | -0.00                               | -0.00                               | 1.17                               | -0.00                               | 45.87                   | 0.30                    | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 11           | 412.05                             | 290.86                             | -0.00                               | -0.00                               | 1.30                               | -0.00                               | 5.85                    | 4.13                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 13           | 481.27                             | 251.55                             | -0.00                               | -0.00                               | 1.18                               | -0.00                               | 4.81                    | 2.52                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 2.537             | -0.000                 | 1.120              | 0.006             | -0.000                 | 0.006                  |
| 3                                           | 1.258             | -0.000                 | 0.673              | 0.003             | -0.000                 | 0.003                  |
| 4                                           | 1.331             | -0.000                 | 0.079              | 0.001             | -0.000                 | 0.001                  |
| 6                                           | 0.491             | -0.000                 | 0.010              | 0.002             | -0.000                 | 0.002                  |
| 8                                           | 0.515             | -0.000                 | 0.009              | 0.002             | -0.000                 | 0.002                  |
| 9                                           | 0.043             | -0.000                 | 0.004              | 0.024             | -0.000                 | 0.024                  |
| 10                                          | 1.147             | -0.000                 | 0.008              | 0.001             | -0.000                 | 0.001                  |
| 11                                          | 1.027             | -0.000                 | 0.725              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 17.20                          | 3.44                 | 446.04                 | 7671.91              | 1.534                  | 738.66                 | 4105.03              | 0.821                  | 1.06                   | 18.15                | 0.0036                 |
| 6                       | 0.30                    | 157.00                         | 0.76                 | 849.56                 | 129132.56            | 0.646                  | 16.94                  | 2574.63              | 0.013                  | 3.41                   | 518.22               | 0.0026                 |
| 8                       | 5.00                    | 123.00                         | 10.21                | 862.75                 | 106118.31            | 8.808                  | 15.17                  | 1865.50              | 0.155                  | 2.91                   | 358.03               | 0.0297                 |
| 10                      | 6.00                    | 46.00                          | 4.60                 | 997.19                 | 45870.94             | 4.587                  | 6.55                   | 301.35               | 0.030                  | 1.17                   | 53.73                | 0.0054                 |
| 11                      | 4.00                    | 14.20                          | 0.95                 | 412.05                 | 5851.16              | 0.392                  | 290.86                 | 4130.23              | 0.277                  | 1.30                   | 18.48                | 0.0012                 |
| TOTAL FOR CYCLE         |                         |                                |                      | 19.960                 |                      | 15.967                 |                        |                      | 1.296                  |                        |                      | 0.0476                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.800                  |                        |                      | 0.065                  |                        |                      | 0.0021                 |

DATE: 6/23/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 214 ENGINE TYPE AND MODEL: 10-S20-P SERIAL NUMBER: 169982A  
 RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130 FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00  
 ATMOSPHERIC PRESSURE: START 28.60 FINISH -0.00  
 INLET AIR HUMIDITY, GRN H2O/LB AIR: 85.00  
 RELATIVE HUMIDITY: -0.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
 SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCFNT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 10.00                             | 81.00             | 0.12346           |
| TAXI-IDLE LOW        | 2            | 2.30        | 0                         | 10.30                             | 99.00             | 0.10606           |
| TAXI-IDLE HIGH       | 3            | 5.40        | 1                         | 14.30                             | 130.50            | 0.10958           |
| RUN-UP               | 4            | 25.40       | 8                         | 31.00                             | 288.00            | 0.10764           |
| TAKE-OFF 100%        | 6            | 259.80      | 86                        | 144.00                            | 1534.50           | 0.09384           |
| CLIMB-RICH           | 8            | 205.90      | 68                        | 112.00                            | 1206.00           | 0.09287           |
| CLIMB-LEAN           | 9            | 207.70      | 69                        | 92.00                             | 1188.00           | 0.07744           |
| APPROACH             | 10           | 32.30       | 10                        | 34.50                             | 306.00            | 0.11275           |
| TAXI-IDLE            | 11           | 5.00        | 1                         | 13.00                             | 112.50            | 0.11556           |
| HOT START            | 13           | 0.0         | 0                         | 8.30                              | 63.00             | 0.13175           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 20000.00             | 100.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 90000.00            | -0.00                         | 10000.00             | 150.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 3500.00              | 110.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 2900.00              | 140.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 2000.00              | 310.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 2000.00              | 420.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 8000.00             | -0.00                         | 1600.00              | 2875.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 81000.00            | -0.00                         | 3600.00              | 115.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 53000.00            | -0.00                         | 7500.00              | 85.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 37500.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 403.23                             | 114.91                             | -0.00                               | -0.00                               | 1.27                               | -0.00                               | 4.03                    | 1.15                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 805.64                             | 64.12                              | -0.00                               | -0.00                               | 2.21                               | -0.00                               | 8.46                    | 0.67                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 677.19                             | 21.92                              | -0.00                               | -0.00                               | 1.57                               | -0.00                               | 9.69                    | 0.31                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 476.82                             | 18.40                              | -0.00                               | -0.00                               | 2.03                               | -0.00                               | 14.78                   | 0.57                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 665.20                             | 13.99                              | -0.00                               | -0.00                               | 5.09                               | -0.00                               | 95.79                   | 2.02                    | -0.00                    | -0.00                    | 0.73                    | -0.00                    |
| 8            | 575.48                             | 14.10                              | -0.00                               | -0.00                               | 6.97                               | -0.00                               | 64.45                   | 1.58                    | -0.00                    | -0.00                    | 0.78                    | -0.00                    |
| 9            | 94.49                              | 12.81                              | -0.00                               | -0.00                               | 55.78                              | -0.00                               | 8.64                    | 1.18                    | -0.00                    | -0.00                    | 5.13                    | -0.00                    |
| 10           | 684.91                             | 22.09                              | -0.00                               | -0.00                               | 1.60                               | -0.00                               | 23.63                   | 0.76                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 11           | 437.85                             | 45.21                              | -0.00                               | -0.00                               | 1.15                               | -0.00                               | 5.69                    | 0.59                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 483.98                             | 205.52                             | -0.00                               | -0.00                               | 1.08                               | -0.00                               | 4.02                    | 1.71                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 3.678             | -0.000                 | 0.293              | 0.010             | -0.000                 | 0.010                  |
| 3                                            | 1.794             | -0.000                 | 0.058              | 0.004             | -0.000                 | 0.004                  |
| 4                                            | 0.582             | -0.000                 | 0.022              | 0.002             | -0.000                 | 0.002                  |
| 6                                            | 0.369             | -0.000                 | 0.008              | 0.003             | -0.000                 | 0.003                  |
| 8                                            | 0.313             | -0.000                 | 0.008              | 0.004             | -0.000                 | 0.004                  |
| 9                                            | 0.042             | -0.000                 | 0.006              | 0.025             | -0.000                 | 0.025                  |
| 10                                           | 0.732             | -0.000                 | 0.024              | 0.002             | -0.000                 | 0.002                  |
| 11                                           | 1.138             | -0.000                 | 0.118              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTO CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 14.30                          | 2.86                 | 677.39                 | 9686.64              | 1.937                  | 21.92                  | 313.47               | 0.063                  | 1.57                   | 22.44                | 0.0045                 |
| 6                       | 0.30                    | 144.00                         | 0.72                 | 665.20                 | 95788.94             | 0.479                  | 13.99                  | 2015.16              | 0.010                  | 5.09                   | 733.46               | 0.0037                 |
| 8                       | 5.00                    | 112.00                         | 9.30                 | 575.48                 | 64453.72             | 5.350                  | 14.10                  | 1578.95              | 0.131                  | 6.97                   | 780.09               | 0.0647                 |
| 10                      | 6.00                    | 34.50                          | 3.45                 | 684.91                 | 23629.47             | 2.363                  | 22.09                  | 762.07               | 0.076                  | 1.60                   | 55.10                | 0.0055                 |
| 11                      | 4.00                    | 13.00                          | 0.87                 | 437.85                 | 5692.07              | 0.381                  | 45.21                  | 587.70               | 0.039                  | 1.15                   | 14.99                | 0.0010                 |
| TOTAL FOR CYCLE         |                         |                                | 17.197               |                        |                      | 10.510                 |                        |                      | 0.319                  |                        |                      | 0.0794                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.611                  |                        |                      | 0.019                  |                        |                      | 0.0046                 |

DATE: 6/23/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 215 ENGINE TYPE AND MODEL: 10-S20-P

SERIAL NUMBER: 1599820

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH -0.00

INLET AIR HUMIDITY, GRN H2O/LB AIR: 85.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 8.10                              | 63.00             | 0.12857           |
| TAXI-IDLE LOW        | 2            | 1.80        | 0                         | 10.30                             | 81.00             | 0.12716           |
| TAXI-IDLE HIGH       | 3            | 4.80        | 1                         | 13.40                             | 121.50            | 0.11029           |
| RUN-UP               | 4            | 23.50       | 7                         | 30.50                             | 279.00            | 0.10932           |
| TAKE-OFF 100%        | 6            | 263.00      | 87                        | 146.00                            | 1561.50           | 0.09350           |
| CLIMB-RICH           | 8            | 207.30      | 69                        | 112.00                            | 1224.00           | 0.09150           |
| CLIMB-LEAN           | 9            | 209.50      | 69                        | 92.00                             | 1210.50           | 0.07600           |
| APPROACH             | 10           | 38.00       | 12                        | 37.00                             | 360.00            | 0.10278           |
| TAXI-IDLE            | 11           | 5.00        | 1                         | 12.80                             | 117.00            | 0.10940           |
| HOT START            | 13           | 0.0         | 0                         | 7.50                              | 63.00             | 0.11905           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 10300.00            | -0.00                         | 35000.00             | 165.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 22500.00             | 208.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 7500.00              | 70.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 33000.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 71500.00            | -0.00                         | 2300.00              | 295.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 57000.00            | -0.00                         | 2000.00              | 400.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 10000.00            | -0.00                         | 1500.00              | 2625.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 83000.00            | -0.00                         | 3800.00              | 115.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 52000.00            | -0.00                         | 7500.00              | 75.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 66500.00            | -0.00                         | 37500.00             | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 74.54                              | 195.25                             | -0.00                               | -0.00                               | 2.02                               | -0.00                               | 0.60                    | 1.58                    | -0.00                    | -0.00                    | 0.07                    | -0.00                    |
| 2            | 406.90                             | 126.53                             | -0.00                               | -0.00                               | 2.57                               | -0.00                               | 4.19                    | 1.30                    | -0.00                    | -0.00                    | 0.03                    | -0.00                    |
| 3            | 574.05                             | 46.76                              | -0.00                               | -0.00                               | C.99                               | -0.00                               | 7.69                    | 0.61                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 578.79                             | 207.04                             | -0.00                               | -0.00                               | 1.29                               | -0.00                               | 17.65                   | 6.31                    | -0.00                    | -0.00                    | 0.04                    | -0.00                    |
| 6            | 717.54                             | 16.13                              | -0.00                               | -0.00                               | 4.86                               | -0.00                               | 104.74                  | 2.36                    | -0.00                    | -0.00                    | 0.71                    | -0.00                    |
| 8            | 583.08                             | 14.25                              | -0.00                               | -0.00                               | 6.72                               | -0.00                               | 65.31                   | 1.60                    | -0.00                    | -0.00                    | 0.75                    | -0.00                    |
| 9            | 119.98                             | 12.16                              | -0.00                               | -0.00                               | 51.73                              | -0.00                               | 11.04                   | 1.12                    | -0.00                    | -0.00                    | 4.76                    | -0.00                    |
| 10           | 764.78                             | 24.92                              | -0.00                               | -0.00                               | 1.74                               | -0.00                               | 28.30                   | 0.92                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 11           | 452.27                             | 47.03                              | -0.00                               | -0.00                               | 1.07                               | -0.00                               | 5.79                    | 0.60                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 13           | 534.03                             | 221.22                             | -0.00                               | -0.00                               | 1.06                               | -0.00                               | 4.01                    | 1.66                    | -0.00                    | -0.00                    | C.01                    | -0.00                    |

| TEST<br>MODE                                 | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 2                                            | 2.328             | -0.000                 | 0.724              | 0.015             | -0.000                 | 0.015                  |
| 3                                            | 1.603             | -0.000                 | 0.131              | 0.003             | -0.000                 | 0.003                  |
| 4                                            | 0.751             | -0.000                 | 0.269              | 0.007             | -0.000                 | 0.002                  |
| 6                                            | 0.398             | -0.000                 | 0.009              | 0.003             | -0.000                 | 0.003                  |
| 8                                            | 0.315             | -0.000                 | 0.008              | 0.004             | -0.000                 | 0.004                  |
| 9                                            | 0.053             | -0.000                 | 0.005              | 0.023             | -0.000                 | 0.023                  |
| 10                                           | 0.745             | -0.000                 | 0.024              | 0.002             | -0.000                 | 0.002                  |
| 11                                           | 1.158             | -0.000                 | 0.120              | 0.003             | -0.000                 | 0.003                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |

## LTU CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/IK<br>LB FUEL | CO<br>LB/IK<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/IK<br>LB FUEL | HC<br>LB/IK<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/IK<br>LB FUEL | NO<br>LB/IK<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 13.40                          | 2.68                 | 574.05                 | 7692.21              | 1.538                  | 46.76                  | 626.52               | 0.125                  | 0.99                   | 11.30                | 0.0027                 |
| 4                       | 0.30                    | 146.00                         | 0.73                 | 717.54                 | 104761.31            | 0.524                  | 16.11                  | 2355.70              | 0.012                  | 4.86                   | 769.97               | 0.0035                 |
| 8                       | 5.00                    | 112.00                         | 9.30                 | 583.08                 | 65305.23             | 5.420                  | 14.25                  | 1595.59              | 0.132                  | 6.72                   | 752.75               | 0.0625                 |
| 10                      | 6.00                    | 37.00                          | 3.70                 | 764.78                 | 28794.92             | 2.830                  | 24.92                  | 922.05               | 0.092                  | 1.74                   | 64.40                | 0.0064                 |
| 11                      | 4.00                    | 12.80                          | 0.86                 | 452.27                 | 5789.10              | 0.388                  | 47.03                  | 601.96               | 0.040                  | 1.07                   | 13.71                | 0.0009                 |
| TOTAL FOR CYCLE         |                         |                                | 17.264               |                        |                      | 10.700                 |                        |                      | 0.402                  |                        |                      | 0.0760                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                      | 0.620                  |                        |                      | 0.023                  |                        |                      | 0.0044                 |

DATE: 6/24/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 216 ENGINE TYPE AND MODEL: IO-520-P

SERIAL NUMBER: 19903

RATED HORSEPOWER: 300.

ENGINE TOTAL TIME: -0. HRS

FUEL: AV GAS 100/130

FUEL W/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.76 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 83.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 10

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 10.50                             | 90.00             | 0.11667           |
| TAXI-IDLE LOW        | 2            | 1.70        | 0                         | 11.30                             | 108.00            | 0.10463           |
| TAXI-IDLE HIGH       | 3            | 4.80        | 1                         | 16.00                             | 148.50            | 0.10774           |
| RUN-UP               | 4            | 23.70       | 7                         | 34.50                             | 306.00            | 0.11275           |
| TAKE-OFF 100%        | 6            | 255.70      | 85                        | 150.00                            | 1534.50           | 0.09775           |
| CLIMB-RICH           | 8            | 201.60      | 67                        | 117.00                            | 1174.50           | 0.09962           |
| CLIMB-LEAN           | 9            | 204.80      | 68                        | 92.00                             | 1161.00           | 0.07924           |
| APPROACH             | 10           | 35.80       | 11                        | 43.00                             | 387.00            | 0.11111           |
| TAXI-IDLE            | 11           | 4.00        | 1                         | 13.30                             | 126.00            | 0.10556           |
| HOT START            | 13           | 0.0         | 0                         | 8.70                              | 63.00             | 0.13810           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 54000.00            | -0.00                         | 42500.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 67000.00            | -0.00                         | 36500.00             | 90.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 81000.00            | -0.00                         | 23000.00             | 105.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 76000.00            | -0.00                         | 7500.00              | 125.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 99000.00            | -0.00                         | 2600.00              | 160.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 8            | -0.00                               | -0.00                              | 76000.00            | -0.00                         | 2400.00              | 250.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 9            | -0.00                               | -0.00                              | 61500.00            | -0.00                         | 1600.00              | 2100.00             | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 10           | -0.00                               | -0.00                              | 116000.00           | -0.00                         | 9500.00              | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 11           | -0.00                               | -0.00                              | 88000.00            | -0.00                         | 42500.00             | 108.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 13           | -0.00                               | -0.00                              | 9000.00             | -0.00                         | 50000.00             | 116.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 442.29                             | 254.41                             | -0.00                               | -0.00                               | 1.21                               | -0.00                               | 4.64                    | 2.67                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 607.60                             | 236.32                             | -0.00                               | -0.00                               | 1.34                               | -0.00                               | 6.87                    | 2.67                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 3            | 714.92                             | 145.81                             | -0.00                               | -0.00                               | 1.52                               | -0.00                               | 11.44                   | 2.33                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 4            | 642.93                             | 46.02                              | -0.00                               | -0.00                               | 1.74                               | -0.00                               | 22.18                   | 1.59                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 955.17                             | 17.67                              | -0.00                               | -0.00                               | 2.54                               | -0.00                               | 143.28                  | 2.65                    | -0.00                    | -0.00                    | 0.38                    | -0.00                    |
| 8            | 720.83                             | 16.09                              | -0.00                               | -0.00                               | 3.89                               | -0.00                               | 84.34                   | 1.88                    | -0.00                    | -0.00                    | 0.46                    | -0.00                    |
| 9            | 712.77                             | 12.60                              | -0.00                               | -0.00                               | 39.98                              | -0.00                               | 65.58                   | 1.16                    | -0.00                    | -0.00                    | 3.68                    | -0.00                    |
| 10           | 994.87                             | 58.91                              | -0.00                               | -0.00                               | 1.13                               | -0.00                               | 42.78                   | 2.53                    | -0.00                    | -0.00                    | 0.05                    | -0.00                    |
| 11           | 791.59                             | 273.44                             | -0.00                               | -0.00                               | 1.60                               | -0.00                               | 10.53                   | 3.64                    | -0.00                    | -0.00                    | 0.02                    | -0.00                    |
| 13           | 62.54                              | 264.78                             | -0.00                               | -0.00                               | 1.32                               | -0.00                               | 0.54                    | 2.30                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |

| TEST<br>MODE                                | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|---------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |
| 2                                           | 4.039             | -0.000                 | 1.571              | 0.009             | -0.000                 | 0.009                  |
| 3                                           | 2.383             | -0.000                 | 0.486              | 0.005             | -0.000                 | 0.005                  |
| 4                                           | 0.936             | -0.000                 | 0.067              | 0.003             | -0.000                 | 0.003                  |
| 6                                           | 0.560             | -0.000                 | 0.010              | 0.001             | -0.000                 | 0.001                  |
| 8                                           | 0.418             | -0.000                 | 0.009              | 0.002             | -0.000                 | 0.002                  |
| 9                                           | 0.320             | -0.000                 | 0.006              | 0.018             | -0.000                 | 0.018                  |
| 10                                          | 1.195             | -0.000                 | 0.071              | 0.001             | -0.000                 | 0.001                  |
| 11                                          | 2.632             | -0.000                 | 0.909              | 0.005             | -0.000                 | 0.005                  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE**** |                   |                        |                    |                   |                        |                        |

## LTD CYCLE EMISSIONS

| TEST<br>MODE            | TIME IN<br>MODE<br>MIN. | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>2<br>LB/1K<br>HOURS | THC<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
|-------------------------|-------------------------|--------------------------------|----------------------|------------------------|---------------------------|-------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| 3                       | 12.00                   | 16.00                          | 3.20                 | 714.92                 | 11438.64                  | 2.288                   | 145.81                 | 2333.00              | 0.467                  | 1.52                   | 24.36                | 0.0049                 |
| 6                       | 0.30                    | 150.00                         | 0.75                 | 955.17                 | 143275.38                 | 0.716                   | 17.67                  | 2650.84              | 0.013                  | 2.54                   | 380.34               | 0.0019                 |
| 8                       | 5.00                    | 117.00                         | 9.71                 | 720.83                 | 84337.63                  | 7.000                   | 16.09                  | 1883.06              | 0.156                  | 3.89                   | 455.69               | 0.0378                 |
| 10                      | 6.00                    | 43.00                          | 4.30                 | 994.87                 | 42779.22                  | 4.278                   | 58.91                  | 2533.01              | 0.253                  | 1.13                   | 48.46                | 0.0048                 |
| 11                      | 4.00                    | 13.30                          | 0.89                 | 791.59                 | 10528.16                  | 0.705                   | 273.44                 | 3636.72              | 0.244                  | 1.60                   | 21.22                | 0.0014                 |
| TOTAL FOR CYCLE         |                         |                                | 18.852               |                        |                           | 14.987                  |                        |                      | 1.133                  |                        |                      | 0.0509                 |
| TOTAL FOR CYCLE/LB FUEL |                         |                                |                      |                        |                           | 0.795                   |                        |                      | 0.060                  |                        |                      | 0.0027                 |

## SUMMARY O-470-R – CLIMB RICH MODE

| MODEL SUMMARY           |          | SAMPLE NUMBER = 4.       |                |                  |                |                  |                  |                |                  |                  |                |                  |
|-------------------------|----------|--------------------------|----------------|------------------|----------------|------------------|------------------|----------------|------------------|------------------|----------------|------------------|
| TEST MODE               |          | MEASURED FUEL FLOW LB/HR | FUEL USED LBS. | CO LB/1K LB FUEL | CO LB/1K HOURS | CO EMISSION LBS. | HC LB/1K LB FUEL | HC LB/1K HOURS | HC EMISSION LBS. | NO LB/1K LB FUEL | NO LB/1K HOURS | NO EMISSION LBS. |
| 3                       | MEAN:    | 15.12                    | 3.02           | 742.58           | 11327.45       | 2.265            | 191.47           | 3054.25        | 0.6108           | 1.02             | 15.97          | 0.0032           |
|                         | STD DEV: | 3.12                     | 0.62           | 188.46           | 3821.09        | 0.764            | 138.40           | 2393.21        | 0.4786           | 0.43             | 8.54           | 0.0017           |
| 6                       | MEAN:    | 131.25                   | 0.66           | 1155.89          | 151707.56      | 0.759            | 20.40            | 2678.52        | 0.0134           | 1.11             | 145.95         | 0.0007           |
|                         | STD DEV: | 1.51                     | 0.01           | 9.92             | 1834.17        | 0.009            | 2.20             | 298.41         | 0.0015           | 0.23             | 32.34          | 0.0002           |
| 8                       | MEAN:    | 85.50                    | 7.10           | 691.66           | 58381.31       | 4.846            | 9.46             | 813.88         | 0.0676           | 9.37             | 756.17         | 0.0628           |
|                         | STD DEV: | 7.72                     | 0.64           | 132.09           | 5097.82        | 0.423            | 1.12             | 155.41         | 0.0129           | 7.79             | 535.33         | 0.0444           |
| 10                      | MEAN:    | 35.25                    | 3.52           | 618.22           | 21676.36       | 2.168            | 14.21            | 497.20         | 0.0497           | 2.42             | 90.40          | 0.0090           |
|                         | STD DEV: | 4.57                     | 0.46           | 73.52            | 2611.55        | 0.261            | 2.54             | 80.33          | 0.0080           | 1.51             | 70.51          | 0.0071           |
| 11                      | MEAN:    | 15.25                    | 1.02           | 559.42           | 8633.44        | 0.578            | 168.45           | 2841.40        | 0.1904           | 0.96             | 15.21          | 0.0010           |
|                         | STD DEV: | 3.00                     | 0.20           | 48.88            | 2359.03        | 0.158            | 134.10           | 2468.20        | 0.1654           | 0.40             | 8.68           | 0.0006           |
| TOTAL FOR CYCLE         |          | MEAN:                    | 15.324         |                  |                | 10.616           |                  |                | 0.932            |                  |                | 0.0767           |
|                         |          | STD DEV:                 | 1.468          |                  |                | 0.881            |                  |                | 0.659            |                  |                | 0.0397           |
| TOTAL FOR CYCLE/LB FUEL |          |                          |                |                  | MEAN:          | 0.695            |                  |                | 0.058            |                  |                | 0.0052           |
|                         |          |                          |                |                  | STD DEV:       | 0.061            |                  |                | 0.038            |                  |                | 0.0033           |

## SUMMARY IO-520-P – CLIMB RICH MODE

| MODEL SUMMARY           |          | SAMPLE NUMBER = 5.             |                      |                        |                      |                        |                        |                      |                        |                        |                      |                        |
|-------------------------|----------|--------------------------------|----------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|------------------------|
| TEST<br>MODE            |          | MEASURED<br>FUEL FLOW<br>LB/HR | FUEL<br>USED<br>LBS. | CO<br>LB/1K<br>LB FUEL | CO<br>LB/1K<br>HOURS | CO<br>EMISSION<br>LBS. | HC<br>LB/1K<br>LB FUEL | HC<br>LB/1K<br>HOURS | HC<br>EMISSION<br>LBS. | NO<br>LB/1K<br>LB FUEL | NO<br>LB/1K<br>HOURS | NO<br>EMISSION<br>LBS. |
| 3                       | MEAN:    | 15.80                          | 3.16                 | 562.15                 | 8739.86              | 1.748                  | 138.84                 | 2348.11              | 0.4696                 | 1.47                   | 23.71                | 0.0047                 |
|                         | STD DEV: | 1.96                           | 0.39                 | 138.81                 | 1785.97              | 0.357                  | 103.20                 | 1887.36              | 0.3775                 | 0.50                   | 10.21                | 0.0020                 |
| 6                       | MEAN:    | 149.20                         | 0.75                 | 809.26                 | 121043.94            | 0.605                  | 16.24                  | 2426.70              | 0.0121                 | 3.84                   | 570.19               | 0.0029                 |
|                         | STD DEV: | 4.15                           | 0.02                 | 116.76                 | 19927.34             | 0.100                  | 1.38                   | 254.74               | 0.0013                 | 1.09                   | 148.90               | 0.0007                 |
| 8                       | MEAN:    | 117.40                         | 9.74                 | 728.44                 | 86184.69             | 7.153                  | 15.06                  | 1770.82              | 0.1470                 | 4.63                   | 534.59               | 0.0444                 |
|                         | STD DEV: | 5.51                           | 0.46                 | 151.72                 | 21853.98             | 1.814                  | 0.88                   | 169.37               | 0.0141                 | 2.08                   | 217.15               | 0.0180                 |
| 10                      | MEAN:    | 41.30                          | 4.13                 | 889.97                 | 37389.69             | 3.739                  | 35.70                  | 1511.39              | 0.1511                 | 1.28                   | 51.21                | 0.0051                 |
|                         | STD DEV: | 5.29                           | 0.53                 | 153.44                 | 10650.04             | 1.065                  | 25.55                  | 1198.83              | 0.1199                 | 0.40                   | 11.04                | 0.0011                 |
| 11                      | MEAN:    | 13.58                          | 0.91                 | 502.07                 | 6788.50              | 0.455                  | 174.07                 | 2415.59              | 0.1618                 | 1.18                   | 15.90                | 0.0011                 |
|                         | STD DEV: | 0.78                           | 0.05                 | 162.66                 | 2095.45              | 0.140                  | 120.25                 | 1699.98              | 0.1139                 | 0.31                   | 3.99                 | 0.0003                 |
| TOTAL FOR CYCLE         |          | MEAN:                          | 18.690               |                        |                      | 13.700                 |                        |                      | 0.942                  |                        |                      | 0.0582                 |
|                         |          | STD DEV:                       | 1.424                |                        |                      | 2.869                  |                        |                      | 0.552                  |                        |                      | 0.0183                 |
| TOTAL FOR CYCLE/LB FUEL |          |                                |                      |                        | MEAN:                | 0.727                  |                        |                      | 0.049                  |                        |                      | 0.0032                 |
|                         |          |                                |                      |                        | STD DEV:             | 0.102                  |                        |                      | 0.026                  |                        |                      | 0.0012                 |

DATE: 6/20/71

TEST ORGANIZATION: TELEDYNE-CONTINENTAL

ENGINE SUPPLIER: TELEDYNE-CONTINENTAL

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 220 ENGINE TYPE AND MODEL: D-470-R

SERIAL NUMBER: 470-R-311302A

RATED HORSEPOWER: 230.

ENGINE TOTAL TIME: -0. MRS

FUEL: AV GAS 80/87 FUEL H/C RATIO: 1.840

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 28.53 FINISH -0.00

INLET AIR HUMIDITY, GRM H2O/LB AIR: 114.00

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

|                      | TEST<br>MODE | SHAFT<br>HP | POWER<br>PERCENT<br>RATED | MEASURED<br>FUEL<br>FLOW<br>LB/HR | AIR FLOW<br>LB/HR | CALCULATED<br>F/A |
|----------------------|--------------|-------------|---------------------------|-----------------------------------|-------------------|-------------------|
| COLD START + 130 SEC | 1            | 0.0         | 0                         | 7.80                              | 72.00             | 0.10833           |
| TAXI-TOLF LOW        | 2            | 1.90        | 0                         | 8.30                              | 81.00             | 0.10247           |
| TAXI-IDLE HIGH       | 3            | 5.00        | 2                         | 13.00                             | 117.00            | 0.11111           |
| RUN-UP               | 4            | 24.00       | 10                        | 21.50                             | 261.00            | 0.08238           |
| TAKE-OFF 100%        | 6            | 109.60      | 82                        | 130.00                            | 1318.50           | 0.09860           |

| TEST<br>MODE | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPHV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPHV | NO<br>(DRY)<br>PPHV | NO<br>2<br>(DRY)<br>PPHV | NO<br>X<br>(DRY)<br>PPHV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 1            | -0.00                               | -0.00                              | 49000.00            | -0.00                         | 23500.00             | 73.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2            | -0.00                               | -0.00                              | 31000.00            | -0.00                         | 20000.00             | 69.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 3            | -0.00                               | -0.00                              | 69000.00            | -0.00                         | 2700.00              | 80.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 4            | -0.00                               | -0.00                              | 78000.00            | -0.00                         | 2000.00              | 145.00              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 6            | -0.00                               | -0.00                              | 122000.00           | -0.00                         | 2500.00              | 100.50              | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |

| TEST<br>MODE | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|--------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 1            | 427.20                             | 148.40                             | -0.00                               | -0.00                               | 1.05                               | -0.00                               | 3.33                    | 1.16                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 2            | 284.51                             | 131.44                             | -0.00                               | -0.00                               | 1.04                               | -0.00                               | 2.36                    | 1.09                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 3            | 587.51                             | 16.74                              | -0.00                               | -0.00                               | 1.12                               | -0.00                               | 7.64                    | 0.22                    | -0.00                    | -0.00                    | 0.01                    | -0.00                    |
| 4            | 868.45                             | 15.34                              | -0.00                               | -0.00                               | 2.65                               | -0.00                               | 18.67                   | 0.33                    | -0.00                    | -0.00                    | 0.06                    | -0.00                    |
| 6            | 1159.60                            | 16.89                              | -0.00                               | -0.00                               | 1.57                               | -0.00                               | 150.75                  | 2.20                    | -0.00                    | -0.00                    | 0.20                    | -0.00                    |

| TEST<br>MODE | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|--------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|--------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|   |       |        |       |       |        |       |
|---|-------|--------|-------|-------|--------|-------|
| 2 | 1.243 | -0.000 | 0.574 | 0.005 | -0.000 | 0.005 |
| 3 | 1.528 | -0.000 | 0.044 | 0.003 | -0.000 | 0.003 |
| 4 | 0.778 | -0.000 | 0.014 | 0.002 | -0.000 | 0.002 |
| 6 | 0.795 | -0.000 | 0.012 | 0.001 | -0.000 | 0.001 |

**TABLE III**

**AUXILIARY POWER UNITS**

**AIRESEARCH MFG.**

**CONTENTS:**

|                        |                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>III-2 TO III-54</b> | <b>INDIVIDUAL ENGINE RUNS – MASS EMISSION CONVERSIONS<br/>ONLY (INCLUDES AIR HORSEPOWER CALCULATED DATA)</b> |
|------------------------|--------------------------------------------------------------------------------------------------------------|

DATE: 5/17/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 35 ENGINE TYPE AND MODEL: GTCP30-92 SERIAL NUMBER: P-28794

RATED SHAFT HORSEPOWER: 40.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROSENE FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 95.00 FINISH 95.00

ATMOSPHERIC PRESSURE: START 28.56 FINISH 28.56

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0012

RELATIVE HUMIDITY: 5.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST MODE | SHAFT HP | POWER HP | AIR HP | ENGINE SPEED RPM | CORRECTED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | F/A CALC FROM EMISSIONS | COMPRESSOR INLET TEMP DEGREES F | COMPRESSOR DISCHARGE PRESSURE PSIA | BLEED FLOW LB/MIN |
|-----------|----------|----------|--------|------------------|---------------------------|-------------------------|-------------------------|---------------------------------|------------------------------------|-------------------|
|           |          |          |        | N1               | N2                        |                         |                         |                                 |                                    |                   |
| 1/ 0      | 0.0      | 0.0      | 0.0    | 59200.00         | -0.00                     | 35.40                   | -0.00                   | 0.008600                        | 83.00                              | 0.0               |
| 6/ 1      | 10.20    | 0.0      | 0.0    | 59200.00         | -0.00                     | 37.40                   | -0.00                   | 0.009300                        | 96.00                              | 0.0               |
| 11/ 6     | 20.30    | 0.0      | 0.0    | 59100.00         | -0.00                     | 40.40                   | -0.00                   | 0.009900                        | 100.00                             | 0.0               |
| 16/11     | 30.50    | 0.0      | 0.0    | 59100.00         | -0.00                     | 43.40                   | -0.00                   | 0.010600                        | 96.00                              | 0.0               |
| 20/16     | 40.70    | 0.0      | 0.0    | 59100.00         | -0.00                     | 47.40                   | -0.00                   | 0.011400                        | 98.00                              | 0.0               |

| POWER PERCENT RATED SHP | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                       | 640.00                     | -0.00                     | 331.40        | 1.72                 | 52.60          | 7.70          | 5.10            | 12.70           | -0.00     | -0.00 | -0.00        |
| 25                      | 675.00                     | -0.00                     | 266.30        | 1.88                 | 24.50          | 9.20          | 5.10            | 14.30           | -0.00     | -0.00 | -0.00        |
| 50                      | 710.00                     | -0.00                     | 224.50        | 2.02                 | 13.50          | 11.30         | 5.00            | 16.30           | -0.00     | -0.00 | -0.00        |
| 76                      | 745.00                     | -0.00                     | 193.00        | 2.15                 | 9.70           | 14.00         | 5.20            | 19.20           | -0.00     | -0.00 | -0.00        |
| 101                     | 795.00                     | -0.00                     | 170.30        | 2.32                 | 6.60           | 16.30         | 5.30            | 21.60           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED SHP | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|-------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                       | 37.14                     | 3.37                      | -0.00                      | 3030.00                    | -0.00                     | 2.44                       | 1.31              | 0.12              | -0.00              | 107.26             | -0.00             | 0.08               |
| 25                      | 27.47                     | 1.44                      | -0.00                      | 3050.00                    | -0.00                     | 2.43                       | 1.03              | 0.05              | -0.00              | 114.07             | -0.00             | 0.09               |
| 50                      | 21.65                     | 0.75                      | -0.00                      | 3050.00                    | -0.00                     | 2.58                       | 0.87              | 0.03              | -0.00              | 123.22             | -0.00             | 0.10               |
| 76                      | 17.49                     | 0.50                      | -0.00                      | 3060.00                    | -0.00                     | 2.86                       | 0.76              | 0.02              | -0.00              | 132.80             | -0.00             | 0.12               |
| 101                     | 14.30                     | 0.32                      | -0.00                      | 3060.00                    | -0.00                     | 2.98                       | 0.68              | 0.02              | -0.00              | 145.04             | -0.00             | 0.14               |

| POWER PERCENT RATED SHP                      | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|----------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                |                  |                 |                |                  |                  |
| 25                                           | 100.738        | 11183.374        | 5.298           | -0.000         | -0.000           | 8.903            |
| 50                                           | 43.083         | 6069.949         | 1.485           | -0.000         | -0.000           | 5.133            |
| 76                                           | 24.892         | 4354.227         | 0.713           | -0.000         | -0.000           | 4.064            |
| 101                                          | 16.654         | 3563.733         | 0.370           | -0.000         | -0.000           | 3.469            |

DATE: 5/17/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 80 ENGINE TYPE AND MODEL: GTCB30-92 SERIAL NUMBER: P-28794  
RATED SHAFT HORSEPOWER: 40.  
ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: AV KEROZ FUEL H/C RATIO: 1.928

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 98.00 FINISH 98.00  
ATMOSPHERIC PRESSURE: START 28.56 FINISH 28.56  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0012  
RELATIVE HUMIDITY: 5.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |                      |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 22/ 0        | 40.60                | 24.30     | 58900.00               | -0.00 | 69.00                              | -0.00                         | 0.020100                         | 97.00                                    | 37.00                                       | 25.51                   |
| 19/22        | 30.40                | 25.74     | 58900.00               | -0.00 | 69.00                              | -0.00                         | 0.019900                         | 98.00                                    | 36.40                                       | 27.52                   |
| 15/19        | 20.30                | 27.00     | 59000.00               | -0.00 | 67.50                              | -0.00                         | 0.019800                         | 99.00                                    | 35.80                                       | 29.43                   |
| 10/15        | 10.20                | 27.79     | 59000.00               | -0.00 | 65.50                              | -0.00                         | 0.019500                         | 98.00                                    | 35.10                                       | 31.13                   |
| 5/10         | 0.0                  | 28.62     | 59000.00               | -0.00 | 64.00                              | -0.00                         | 0.019100                         | 98.00                                    | 34.70                                       | 32.54                   |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 101                              | 1318.00                             | -0.00                              | 107.00              | 4.07                          | 4.90                 | 41.80               | 4.10                     | 45.90                    | -0.00     | -0.00 | -0.00        |
| 75                               | 1320.00                             | -0.00                              | 111.50              | 4.02                          | 4.90                 | 40.40               | 3.90                     | 44.30                    | -0.00     | -0.00 | -0.00        |
| 50                               | 1320.00                             | -0.00                              | 111.50              | 4.00                          | 3.80                 | 39.20               | 3.50                     | 42.70                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1320.00                             | -0.00                              | 121.30              | 3.94                          | 3.50                 | 37.60               | 3.70                     | 41.30                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1320.00                             | -0.00                              | 123.90              | 3.88                          | 3.20                 | 36.00               | 4.30                     | 40.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 101                              | 5.04                               | 0.13                               | -0.00                               | 3020.00                             | -0.00                              | 3.55                                | 0.35                    | 0.01                    | -0.00                    | 208.38                   | -0.00                   | 0.25                     |
| 75                               | 5.32                               | 0.13                               | -0.00                               | 3020.00                             | -0.00                              | 3.47                                | 0.37                    | 0.01                    | -0.00                    | 208.38                   | -0.00                   | 0.24                     |
| 50                               | 5.35                               | 0.10                               | -0.00                               | 3020.00                             | -0.00                              | 3.36                                | 0.36                    | 0.01                    | -0.00                    | 203.85                   | -0.00                   | 0.23                     |
| 25                               | 5.91                               | 0.10                               | -0.00                               | 3020.00                             | -0.00                              | 3.31                                | 0.39                    | 0.01                    | -0.00                    | 197.81                   | -0.00                   | 0.22                     |
| 0                                | 6.14                               | 0.09                               | -0.00                               | 3020.00                             | -0.00                              | 3.28                                | 0.39                    | 0.01                    | -0.00                    | 193.28                   | -0.00                   | 0.21                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 101                              | 5.361             | 3210.677               | 0.141              | -0.000            | -0.000                 | 3.777                  |
| 75                               | 6.544             | 3712.036               | 0.163              | -0.000            | -0.000                 | 4.270                  |
| 50                               | 7.636             | 4309.762               | 0.150              | -0.000            | -0.000                 | 4.802                  |
| 25                               | 10.195            | 5206.340               | 0.171              | -0.000            | -0.000                 | 5.795                  |
| 0                                | 13.738            | 6752.922               | 0.201              | -0.000            | -0.000                 | 7.339                  |

DATE: 5/10/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 153 ENGINE TYPE AND MODEL: GTCP30-92 SERIAL NUMBER: P-28794

RATED SHAFT HORSEPOWER: 40.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 28.84 FINISH 28.84

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0020

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SMP LOADING ONLY

| TEST MODE | SHAFT HP | POWER | AIR HP   | ENGINE SPEED RPM | CORRECTED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | F/A CALC FROM EMISSIONS | COMPRESSOR INLET TEMP DEGREES F | COMPRESSOR DISCHARGE PRESSURE PSIA | BLEED FLOW LB/MIN |
|-----------|----------|-------|----------|------------------|---------------------------|-------------------------|-------------------------|---------------------------------|------------------------------------|-------------------|
|           |          |       |          | N1               | N2                        |                         |                         |                                 |                                    |                   |
| 1/ 0      | 0.0      | 0.0   | 59200.00 | -0.00            | 36.40                     | -0.00                   | 0.008600                | 82.00                           | 40.20                              | 0.0               |
| 6/ 1      | 10.20    | 0.0   | 59200.00 | -0.00            | 39.40                     | -0.00                   | 0.009400                | 85.00                           | 40.20                              | 0.0               |
| 11/ 4     | 20.40    | 0.0   | 59200.00 | -0.00            | 42.40                     | -0.00                   | 0.009900                | 85.00                           | 40.30                              | 0.0               |
| 16/11     | 30.50    | 0.0   | 59000.00 | -0.00            | 46.40                     | -0.00                   | 0.010300                | 83.00                           | 40.50                              | 0.0               |
| 20/16     | 40.60    | 0.0   | 58900.00 | -0.00            | 50.30                     | -0.00                   | 0.010900                | 88.00                           | 40.50                              | 0.0               |

| POWER PERCENT RATED SMP | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                       | 610.00                     | -0.00                     | 234.50        | 1.74                 | 7.30           | 12.00         | 7.20            | 19.20           | -0.00     | -0.00 | -0.00        |
| 25                      | 650.00                     | -0.00                     | 257.10        | 1.90                 | 5.30           | 13.10         | 7.60            | 20.80           | -0.00     | -0.00 | -0.00        |
| 50                      | 695.00                     | -0.00                     | 271.40        | 2.01                 | 5.60           | 14.00         | 8.00            | 22.10           | -0.00     | -0.00 | -0.00        |
| 76                      | 765.00                     | -0.00                     | 309.50        | 2.08                 | 7.10           | 15.90         | 8.60            | 24.50           | -0.00     | -0.00 | -0.00        |
| 101                     | 850.00                     | -0.00                     | 332.80        | 2.20                 | 6.50           | 16.60         | 9.60            | 26.20           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED SMP | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|-------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                       | 26.19                     | 0.47                      | -0.00                      | 3060.00                    | -0.00                     | 3.52                       | 0.95              | 0.02              | -0.00              | 111.38             | -0.00             | 0.13               |
| 25                      | 26.25                     | 0.31                      | -0.00                      | 3050.00                    | -0.00                     | 3.48                       | 1.03              | 0.01              | -0.00              | 120.17             | -0.00             | 0.14               |
| 50                      | 26.21                     | 0.31                      | -0.00                      | 3050.00                    | -0.00                     | 3.50                       | 1.11              | 0.01              | -0.00              | 129.32             | -0.00             | 0.15               |
| 76                      | 28.87                     | 0.38                      | -0.00                      | 3040.00                    | -0.00                     | 3.76                       | 1.34              | 0.02              | -0.00              | 141.06             | -0.00             | 0.17               |
| 101                     | 29.22                     | 0.33                      | -0.00                      | 3040.00                    | -0.00                     | 3.78                       | 1.47              | 0.02              | -0.00              | 152.91             | -0.00             | 0.19               |

| POWER PERCENT RATED SMP                      | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|----------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                |                  |                 |                |                  |                  |
| 25                                           | 101.409        | 11781.367        | 1.186           | -0.000         | -0.000           | 13.454           |
| 50                                           | 54.484         | 6339.211         | 0.640           | -0.000         | -0.000           | 7.279            |
| 76                                           | 43.922         | 4624.785         | 0.572           | -0.000         | -0.000           | 5.719            |
| 101                                          | 36.199         | 3766.305         | 0.408           | -0.000         | -0.000           | 4.688            |

DATE: 5/18/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 86 ENGINE TYPE AND MODEL: GTC30-92 SERIAL NUMBER: P-28794

RATED SHAFT HORSEPOWER: 40.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KERNS FUEL H/C RATIO: 1.928

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 93.00 FINISH 93.00

ATMOSPHERIC PRESSURE: START 28.84 FINISH 28.84

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0020

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 0.0 , FLOW RATE, LITERS/MIN: 0.0

SAMPLE LINE TRANSPORT TIME, SEC: 0.0

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |             |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 22/ 0        | 40.30       | 19.65       | 58600.00  | -0.00                  | 68.00 | -0.00                              | 0.015700                      | 89.00                            | 18.30                                    | 20.07                                       |                         |
| 19/22        | 30.30       | 22.92       | 58600.00  | -0.00                  | 68.00 | -0.00                              | 0.015900                      | 91.00                            | 17.40                                    | 24.00                                       |                         |
| 15/19        | 20.20       | 25.56       | 58600.00  | -0.00                  | 67.00 | -0.00                              | 0.017100                      | 95.00                            | 36.50                                    | 27.39                                       |                         |
| 10/15        | 10.10       | 28.14       | 58600.00  | -0.00                  | 67.00 | -0.00                              | 0.017700                      | 96.00                            | 35.70                                    | 30.95                                       |                         |
| 5/10         | 0.0         | 29.15       | 59600.00  | -0.00                  | 66.00 | -0.00                              | 0.017900                      | 95.00                            | 35.10                                    | 32.82                                       |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 100                              | 1315.00                             | -0.00                              | 341.20              | 3.17                          | 3.10                 | 28.90               | 9.90                     | 38.80                    | -0.00     | -0.00 | -0.00        |
| 75                               | 1320.00                             | -0.00                              | 345.40              | 3.21                          | 2.60                 | 29.50               | 9.20                     | 38.70                    | -0.00     | -0.00 | -0.00        |
| 50                               | 1320.00                             | -0.00                              | 342.30              | 3.44                          | 1.80                 | 31.60               | 8.90                     | 40.50                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1335.00                             | -0.00                              | 346.80              | 3.56                          | 1.50                 | 34.50               | 9.30                     | 43.70                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1330.00                             | -0.00                              | 341.10              | 3.60                          | 1.00                 | 35.30               | 9.40                     | 44.70                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 100                              | 20.70                              | 0.11                               | -0.00                               | 3020.00                             | -0.00                              | 3.87                                | 1.41                    | 0.01                    | -0.00                    | 205.36                   | -0.00                   | 0.26                     |
| 75                               | 20.67                              | 0.09                               | -0.00                               | 3020.00                             | -0.00                              | 3.08                                | 1.41                    | 0.01                    | -0.00                    | 205.36                   | -0.00                   | 0.21                     |
| 50                               | 19.09                              | 0.06                               | -0.00                               | 3010.00                             | -0.00                              | 3.71                                | 1.29                    | 0.00                    | -0.00                    | 201.67                   | -0.00                   | 0.25                     |
| 25                               | 18.65                              | 0.05                               | -0.00                               | 3010.00                             | -0.00                              | 3.86                                | 1.25                    | 0.00                    | -0.00                    | 201.67                   | -0.00                   | 0.26                     |
| 0                                | 18.15                              | 0.03                               | -0.00                               | 3010.00                             | -0.00                              | 3.90                                | 1.20                    | 0.00                    | -0.00                    | 198.66                   | -0.00                   | 0.26                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| 100                              | 23.477               | 3425.472                  | 0.121                 | -0.000               | -0.000                    | 4.388                     |
| 75                               | 26.418               | 3858.880                  | 0.117                 | -0.000               | -0.000                    | 3.916                     |
| 50                               | 27.944               | 4406.688                  | 0.085                 | -0.000               | -0.000                    | 5.429                     |
| 25                               | 32.681               | 5273.629                  | 0.081                 | -0.000               | -0.000                    | 6.777                     |
| 0                                | 41.092               | 6816.168                  | 0.070                 | -0.000               | -0.000                    | 8.814                     |

DATE: 5/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 36 ENGINE TYPE AND MODEL: GTC36-6 SERIAL NUMBER: P-34696  
 RATED SHAFT HORSEPOWER: 160.  
 ENGINE TOTAL TIME: 0. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: 0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS  
 FUEL: JP-5 FUEL W/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 98.00 FINISH 98.00  
 ATMOSPHERIC PRESSURE: START 28.65 FINISH 28.65  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0050  
 RELATIVE HUMIDITY: 14.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00; FLOW RATE, LITERS/MIN: -0.00  
 SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 3

COMMENTS:

SMP LOADING ONLY

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |                      |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0                  | 0.0       | 59200.00               | -0.00 | 64.50                              | -0.00                         | 0.007400                         | 98.00                                    | 53.00                                       | 0.0                     |
| 6/ 1         | 41.00                | 0.0       | 59100.00               | -0.00 | 68.30                              | -0.00                         | 0.009600                         | 98.00                                    | 53.20                                       | 0.0                     |
| 11/ 6        | 53.70                | 0.0       | 59000.00               | -0.00 | 94.10                              | -0.00                         | 0.010400                         | 98.00                                    | 53.20                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SMP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 25                               | 715.00                              | -0.00                              | 206.50              | 1.96                          | 15.20                | 18.90               | 10.30                    | 29.20                    | -0.00     | -0.00 | -0.00        |
| 33                               | 750.00                              | -0.00                              | 218.80              | 2.12                          | 14.60                | 20.20               | 12.10                    | 32.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SMP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 25                               | 20.56                              | 0.86                               | -0.00                               | 3070.00                             | -0.00                              | 4.77                                | 1.40                    | 0.06                    | -0.00                    | 209.68                   | -0.00                   | 0.33                     |
| 33                               | 20.15                              | 0.77                               | -0.00                               | 3070.00                             | -0.00                              | 4.89                                | 1.90                    | 0.07                    | -0.00                    | 288.89                   | -0.00                   | 0.46                     |

| POWER<br>PERCENT<br>RATED<br>SMP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 33                               | 35.311            | 5379.641               | 1.348              | -0.000            | -0.000                 | 8.565                  |

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |          |       |        |        |       |
|----|--------|----------|-------|--------|--------|-------|
| 25 | 34.250 | 5114.164 | 1.438 | -0.000 | -0.000 | 7.954 |
| 33 | 35.311 | 5379.641 | 1.348 | -0.000 | -0.000 | 8.565 |

DATE: 5/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 81 ENGINE TYPE AND MODEL: GTC36-6 SERIAL NUMBER: P-34696  
RATED SHAFT HORSEPOWER: 160.  
ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 101.00 FINISH 101.00  
ATMOSPHERIC PRESSURE: START 28.65 FINISH 28.65  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0050  
RELATIVE HUMIDITY: 14.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 3

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER     |  | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-----------|--|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             | AIR<br>HP |  | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 15/ 0        | 91.10       | 56.38     |  | 58400.00               | -0.00 | 149.40                             | -0.00                         | 0.018700                         | 100.00                                   | 50.10                                       | 42.35                   |
| 10/15        | 40.60       | 73.93     |  | 58600.00               | -0.00 | 137.00                             | -0.00                         | 0.017600                         | 101.00                                   | 47.00                                       | 59.04                   |
| 5/10         | 0.0         | 96.41     |  | 59900.00               | -0.00 | 123.90                             | -0.00                         | 0.018000                         | 102.00                                   | 44.30                                       | 81.70                   |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 56                               | 1200.00                             | -0.00                              | 243.30              | 3.79                          | 3.90                 | 47.50               | 12.20                    | 59.70                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1195.00                             | -0.00                              | 291.90              | 3.58                          | 7.20                 | 40.90               | 13.40                    | 54.30                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1175.00                             | -0.00                              | 259.00              | 3.65                          | 9.00                 | 41.30               | 12.60                    | 53.90                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 56                               | 12.38                              | 0.11                               | -0.00                               | 3030.00                             | -0.00                              | 4.98                                | 1.85                    | 0.02                    | -0.00                    | 452.68                   | -0.00                   | 0.74                     |
| 25                               | 15.72                              | 0.22                               | -0.00                               | 3030.00                             | -0.00                              | 4.81                                | 2.15                    | 0.03                    | -0.00                    | 415.11                   | -0.00                   | 0.66                     |
| 0                                | 13.68                              | 0.27                               | -0.00                               | 3030.00                             | -0.00                              | 4.69                                | 1.70                    | 0.03                    | -0.00                    | 375.42                   | -0.00                   | 0.58                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 56                               | 12.540            | 3069.376               | 0.115              | -0.000            | -0.000                 | 5.050                  |
| 25                               | 18.810            | 3624.527               | 0.266              | -0.000            | -0.000                 | 5.749                  |
| 0                                | 17.588            | 3894.060               | 0.349              | -0.000            | -0.000                 | 6.013                  |

DATE: 9/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 37 ENGINE TYPE AND MODEL: GTCP36-6

SERIAL NUMBER: P-34772

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. MRS

TIME SINCE HOT SECTION OVERHAUL: 0. MRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. MRS

N2 COMPRESSOR OVERHAUL: 0. MRS

COMBUSTOR CAN REPLACEMENT: 0. MRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. MRS

N1 TURBINE OVERHAUL: 0. MRS

N2 TURBINE OVERHAUL: 0. MRS

FUEL: JP-5 FUEL W/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0048

RELATIVE HUMIDITY: 17.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0                | 29100.00               | -0.00 | -0.00 | 72.60                              | -0.00                         | 0.008000                         | 84.00                                    | 52.90                                       | 0.0                     |
| 6/ 1         | 39.50       | 0.0                | 58900.00               | -0.00 | -0.00 | 90.40                              | -0.00                         | 0.010100                         | 86.00                                    | 53.40                                       | 0.0                     |
| 11/ 6        | 78.70       | 0.0                | 58600.00               | -0.00 | -0.00 | 109.60                             | -0.00                         | 0.012200                         | 88.00                                    | 54.40                                       | 0.0                     |
| 16/11        | 114.00      | 0.0                | 58500.00               | -0.00 | -0.00 | 128.70                             | -0.00                         | 0.014300                         | 89.00                                    | 54.40                                       | 0.0                     |
| 20/16        | 118.70      | 0.0                | 28300.00               | -0.00 | -0.00 | 132.90                             | -0.00                         | 0.015000                         | 90.00                                    | 54.10                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 540.00                              | -0.00                              | 114.10              | 1.63                          | 3.50                 | 16.00               | 5.20                     | 21.30                    | -0.00     | -0.00 | -0.00        |
| 24                               | 635.00                              | -0.00                              | 130.10              | 2.06                          | 1.80                 | 21.10               | 8.10                     | 29.20                    | -0.00     | -0.00 | -0.00        |
| 49                               | 740.00                              | -0.00                              | 130.70              | 2.50                          | 1.40                 | 27.40               | 9.70                     | 37.10                    | -0.00     | -0.00 | -0.00        |
| 71                               | 860.00                              | -0.00                              | 122.80              | 2.93                          | 0.50                 | 37.60               | 9.20                     | 46.80                    | -0.00     | -0.00 | -0.00        |
| 74                               | 905.00                              | -0.00                              | 120.20              | 3.07                          | 0.30                 | 41.40               | 8.70                     | 50.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 13.75                              | 0.24                               | -0.00                               | 3090.00                             | -0.00                              | 4.21                                | 1.00                    | 0.02                    | -0.00                    | 224.33                   | -0.00                   | 0.31                     |
| 24                               | 12.38                              | 0.10                               | -0.00                               | 3080.00                             | -0.00                              | 4.56                                | 1.12                    | 0.01                    | -0.00                    | 279.05                   | -0.00                   | 0.41                     |
| 49                               | 10.21                              | 0.06                               | -0.00                               | 3070.00                             | -0.00                              | 4.76                                | 1.12                    | 0.01                    | -0.00                    | 336.47                   | -0.00                   | 0.52                     |
| 71                               | 8.17                               | 0.02                               | -0.00                               | 3060.00                             | -0.00                              | 5.12                                | 1.05                    | 0.00                    | -0.00                    | 393.82                   | -0.00                   | 0.66                     |
| 74                               | 7.62                               | 0.01                               | -0.00                               | 3060.00                             | -0.00                              | 5.21                                | 1.01                    | 0.00                    | -0.00                    | 406.67                   | -0.00                   | 0.69                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |          |       |        |        |        |
|----|--------|----------|-------|--------|--------|--------|
| 24 | 28.389 | 7064.496 | 0.225 | -0.000 | -0.000 | 10.464 |
| 49 | 14.222 | 4275.371 | 0.089 | -0.000 | -0.000 | 6.630  |
| 71 | 9.226  | 3454.578 | 0.024 | -0.000 | -0.000 | 5.777  |
| 74 | 8.528  | 3426.063 | 0.011 | -0.000 | -0.000 | 5.832  |

DATE: 5/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL TO NUMBER: 82 ENGINE TYPE AND MODEL: GTC36-6 SERIAL NUMBER: P-34772

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 93.00 FINISH 93.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0048

RELATIVE HUMIDITY: 17.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 3

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGRFES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |                    | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 15/ 0        | 78.20       | 64.63              | 58200.00               | -0.00 | 139.80                             | -0.00                         | 0.018700                         | 93.00                                    | 50.10                                       | 49.16                   |
| 10/15        | 39.10       | 80.39              | 58300.00               | -0.00 | 132.90                             | -0.00                         | 0.017000                         | 94.00                                    | 47.30                                       | 64.60                   |
| 5/10         | 0.0         | 86.25              | 58500.00               | -0.00 | 122.70                             | -0.00                         | 0.017600                         | 93.00                                    | 44.30                                       | 74.28                   |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 48                               | 1145.00                             | -0.00                              | 116.90              | 3.80                          | 0.40                 | 47.40               | 7.30                     | 54.70                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1155.00                             | -0.00                              | 100.00              | 3.47                          | 0.60                 | 54.70               | 6.90                     | 61.50                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1155.00                             | -0.00                              | 106.90              | 3.59                          | 0.50                 | 50.50               | 6.30                     | 56.80                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 48                               | 5.95                               | 0.01                               | -0.00                               | 3040.00                             | -0.00                              | 4.57                                | 0.83                    | 0.00                    | -0.00                    | 424.99                   | -0.00                   | 0.64                     |
| 24                               | 5.59                               | 0.02                               | -0.00                               | 3050.00                             | -0.00                              | 5.66                                | 0.74                    | 0.00                    | -0.00                    | 405.34                   | -0.00                   | 0.75                     |
| 0                                | 5.78                               | 0.01                               | -0.00                               | 3050.00                             | -0.00                              | 5.04                                | 0.71                    | 0.00                    | -0.00                    | 374.21                   | -0.00                   | 0.62                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 48                               | 5.820             | 2975.469               | 0.010              | -0.000            | -0.000                 | 4.477                  |
| 24                               | 6.223             | 3392.153               | 0.020              | -0.000            | -0.000                 | 6.291                  |
| 0                                | 8.220             | 4319.047               | 0.021              | -0.000            | -0.000                 | 7.149                  |

DATE: 5/26/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 38 ENGINE TYPE AND MODEL: GTCp60-4 SERIAL NUMBER: P-37596

RATED SHAFT HORSEPOWER: 300.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

M1 COMPRESSOR OVERHAUL: 0. HRS  
M2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
M1 TURBINE OVERHAUL: 0. HRS  
M2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 28.69 FINISH 28.69

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0037

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP ONLY, SURGE VALVE OPEN

| TEST MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | NI    | M2 | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|-----------|----------------------|-----------|------------------------|-------|----|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0      | 0.0                  | 0.0       | 20020.00               | -0.00 |    | 596.00                             | -0.00                         | 0.008000                         | 86.00                                    | 55.10                                       | 0.0                     |
| 6/ 1      | 74.90                | 0.0       | 20010.00               | -0.00 |    | 641.50                             | -0.00                         | 0.008400                         | 87.00                                    | 55.70                                       | 0.0                     |
| 11/ 6     | 150.10               | 0.0       | 20010.00               | -0.00 |    | 686.00                             | -0.00                         | 0.009300                         | 88.00                                    | 56.20                                       | 0.0                     |
| 16/11     | 224.90               | 0.0       | 20020.00               | -0.00 |    | 725.00                             | -0.00                         | 0.009700                         | 88.00                                    | 56.80                                       | 0.0                     |
| 20/16     | 302.30               | 0.0       | 20010.00               | -0.00 |    | 773.00                             | -0.00                         | 0.010500                         | 89.00                                    | 57.10                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 681.00                              | -0.00                              | 116.70              | 1.63                          | 11.20                | 18.40               | 5.20                     | 23.50                    | -0.00     | -0.00 | -0.00        |
| 24                               | 723.00                              | -0.00                              | 114.00              | 1.72                          | 9.60                 | 20.60               | 5.40                     | 26.00                    | -0.00     | -0.00 | -0.00        |
| 50                               | 763.00                              | -0.00                              | 117.20              | 1.90                          | 9.40                 | 22.30               | 5.90                     | 28.20                    | -0.00     | -0.00 | -0.00        |
| 74                               | 801.00                              | -0.00                              | 112.50              | 1.98                          | 8.50                 | 24.60               | 5.80                     | 30.40                    | -0.00     | -0.00 | -0.00        |
| 100                              | 849.00                              | -0.00                              | 117.80              | 2.16                          | 9.30                 | 27.20               | 6.10                     | 33.40                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 14.08                              | 0.77                               | -0.00                               | 3090.00                             | -0.00                              | 4.67                                | 8.39                    | 0.46                    | -0.00                    | 1841.64                  | -0.00                   | 2.78                     |
| 24                               | 13.04                              | 0.63                               | -0.00                               | 3090.00                             | -0.00                              | 4.89                                | 8.36                    | 0.40                    | -0.00                    | 1982.23                  | -0.00                   | 3.13                     |
| 50                               | 12.12                              | 0.56                               | -0.00                               | 3090.00                             | -0.00                              | 4.78                                | 8.31                    | 0.38                    | -0.00                    | 2119.74                  | -0.00                   | 3.28                     |
| 74                               | 11.17                              | 0.48                               | -0.00                               | 3090.00                             | -0.00                              | 4.95                                | 8.10                    | 0.35                    | -0.00                    | 2240.25                  | -0.00                   | 3.59                     |
| 100                              | 10.72                              | 0.48                               | -0.00                               | 3080.00                             | -0.00                              | 4.99                                | 8.29                    | 0.37                    | -0.00                    | 2380.84                  | -0.00                   | 3.85                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 24                                           | 111.650           | 26465.082              | 5.353              | -0.000            | -0.000                 | 41.847                 |
| 50                                           | 55.374            | 14122.184              | 2.546              | -0.000            | -0.000                 | 21.860                 |
| 74                                           | 36.002            | 9961.090               | 1.563              | -0.000            | -0.000                 | 15.970                 |
| 100                                          | 27.407            | 7875.758               | 1.230              | -0.000            | -0.000                 | 12.750                 |

DATE: 5/26/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 83 ENGINE TYPE AND MODEL: GTC660-4 SERIAL NUMBER: P-37596  
RATED SHAFT HORSEPOWER: 300.  
ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 91.00  
ATMOSPHERIC PRESSURE: START 28.69 FINISH 28.69  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0037  
RELATIVE HUMIDITY: 15.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

COMBINATION SMP/BLFED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1     | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|--------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 302.40      | 630.10      | 20020.00  | -0.00                  | 970.00 | -0.00 | 970.00                             | -0.00                         | 0.016900                         | 89.00                                    | 51.70                                       | 468.46                  |
| 19/22        | 227.30      | 637.51      | 20010.00  | -0.00                  | 442.00 | -0.00 | 442.00                             | -0.00                         | 0.016400                         | 90.00                                    | 50.50                                       | 483.82                  |
| 15/19        | 150.10      | 651.35      | 20010.00  | -0.00                  | 914.00 | -0.00 | 914.00                             | -0.00                         | 0.016200                         | 90.00                                    | 49.40                                       | 504.98                  |
| 10/15        | 74.90       | 659.68      | 20010.00  | -0.00                  | 885.00 | -0.00 | 885.00                             | -0.00                         | 0.016400                         | 92.00                                    | 48.00                                       | 524.23                  |
| 5/10         | 0.0         | 665.27      | 20020.00  | -0.00                  | 872.00 | -0.00 | 872.00                             | -0.00                         | 0.015900                         | 92.00                                    | 46.90                                       | 541.12                  |
| 3/ 5         | 0.0         | 564.58      | 20010.00  | -0.00                  | 757.00 | -0.00 | 757.00                             | -0.00                         | 0.012700                         | 95.00                                    | 49.60                                       | 432.06                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 100                              | 1209.00                             | -0.00                              | 146.60              | 3.45                          | 9.00                 | 49.30               | 8.80                     | 58.10                    | -0.00     | -0.00 | -0.00        |
| 75                               | 1202.00                             | -0.00                              | 146.70              | 3.34                          | 12.30                | 48.70               | 8.20                     | 56.80                    | -0.00     | -0.00 | -0.00        |
| 50                               | 1194.00                             | -0.00                              | 143.50              | 3.30                          | 10.00                | 46.50               | 8.50                     | 55.00                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1187.00                             | -0.00                              | 154.10              | 3.34                          | 13.00                | 47.60               | 7.90                     | 55.50                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1180.00                             | -0.00                              | 156.80              | 3.25                          | 11.80                | 45.10               | 8.50                     | 53.60                    | -0.00     | -0.00 | -0.00        |
| 0                                | 953.00                              | -0.00                              | 129.40              | 2.59                          | 13.40                | 34.30               | 6.90                     | 41.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 100                              | 8.24                               | 0.29                               | -0.00                               | 3050.00                             | -0.00                              | 5.36                                | 8.00                    | 0.28                    | -0.00                    | 2958.50                  | -0.00                   | 5.20                     |
| 75                               | 8.53                               | 0.41                               | -0.00                               | 3050.00                             | -0.00                              | 5.43                                | 3.77                    | 0.18                    | -0.00                    | 1348.10                  | -0.00                   | 2.40                     |
| 50                               | 8.43                               | 0.34                               | -0.00                               | 3050.00                             | -0.00                              | 5.31                                | 7.70                    | 0.31                    | -0.00                    | 2787.70                  | -0.00                   | 4.85                     |
| 24                               | 8.96                               | 0.43                               | -0.00                               | 3050.00                             | -0.00                              | 5.30                                | 7.93                    | 0.38                    | -0.00                    | 2699.25                  | -0.00                   | 4.69                     |
| 0                                | 9.38                               | 0.40                               | -0.00                               | 3050.00                             | -0.00                              | 5.26                                | 8.17                    | 0.35                    | -0.00                    | 2659.60                  | -0.00                   | 4.59                     |
| 0                                | 9.76                               | 0.58                               | -0.00                               | 3070.00                             | -0.00                              | 5.11                                | 7.39                    | 0.44                    | -0.00                    | 2121.99                  | -0.00                   | 3.87                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| 100                              | 8.574                | 3172.655                  | 0.301                 | -0.000               | -0.000                    | 5.579                     |
| 75                               | 4.360                | 1559.845                  | 0.208                 | -0.000               | -0.000                    | 2.773                     |
| 50                               | 9.609                | 3478.325                  | 0.383                 | -0.000               | -0.000                    | 6.057                     |
| 24                               | 10.794               | 3674.553                  | 0.522                 | -0.000               | -0.000                    | 6.391                     |
| 0                                | 12.288               | 3997.783                  | 0.550                 | -0.000               | -0.000                    | 6.900                     |
| 0                                | 13.093               | 4116.340                  | 0.774                 | -0.000               | -0.000                    | 6.859                     |

DATE: 5/25/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 39 ENGINE TYPE AND MODEL: GTCM640-4

SERIAL NUMBER: P-37705

RATED SHAFT HORSEPOWER: 300.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

M1 COMPRESSOR OVERHAUL: 0. HRS

M2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

M1 TURBINE OVERHAUL: 0. HRS

M2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 96.00 FINISH 96.00

ATMOSPHERIC PRESSURE: START 28.58 FINISH 28.58

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0031

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP ONLY, SURGE VALVE OPEN

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | THC<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |     |
|--------------|----------------------|-----------|------------------------|------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|-----|
| 1/ 0         | 0.0                  | 0.0       | 20010.00               | -0.00                        | 596.00                        | -0.00                            | 0.007700                                 | 96.00                                       | 54.10                   | 0.0 |
| 6/ 1         | 74.90                | 0.0       | 20010.00               | -0.00                        | 636.50                        | -0.00                            | 0.008200                                 | 96.00                                       | 54.70                   | 0.0 |
| 11/ 6        | 151.10               | 0.0       | 20000.00               | -0.00                        | 685.00                        | -0.00                            | 0.009000                                 | 96.00                                       | 55.30                   | 0.0 |
| 16/11        | 225.90               | 0.0       | 2000.00                | -0.00                        | 723.00                        | -0.00                            | 0.009600                                 | 97.00                                       | 56.00                   | 0.0 |
| 20/16        | 302.30               | 0.0       | 20010.00               | -0.00                        | 757.00                        | -0.00                            | 0.010100                                 | 96.00                                       | 56.60                   | 0.0 |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 681.00                              | -0.00                              | 77.10               | 1.58                          | 21.30                | 17.00               | 3.80                     | 20.80                    | -0.00     | -0.00 | -0.00        |
| 24                               | 719.00                              | -0.00                              | 80.40               | 1.68                          | 10.60                | 20.50               | 4.80                     | 25.20                    | -0.00     | -0.00 | -0.00        |
| 50                               | 767.00                              | -0.00                              | 87.40               | 1.85                          | 28.50                | 23.10               | 5.20                     | 28.30                    | -0.00     | -0.00 | -0.00        |
| 75                               | 800.00                              | -0.00                              | 92.80               | 1.96                          | 8.40                 | 25.20               | 5.90                     | 31.10                    | -0.00     | -0.00 | -0.00        |
| 100                              | 823.00                              | -0.00                              | 103.80              | 2.06                          | 19.00                | 27.40               | 6.30                     | 33.70                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 9.61                               | 1.52                               | -0.00                               | 3100.00                             | -0.00                              | 4.26                                | 5.73                    | 0.90                    | -0.00                    | 1847.60                  | -0.00                   | 2.54                     |
| 24                               | 9.41                               | 0.71                               | -0.00                               | 3100.00                             | -0.00                              | 4.85                                | 5.99                    | 0.45                    | -0.00                    | 1973.15                  | -0.00                   | 3.09                     |
| 50                               | 9.28                               | 1.73                               | -0.00                               | 3090.00                             | -0.00                              | 4.93                                | 6.36                    | 1.18                    | -0.00                    | 2116.65                  | -0.00                   | 3.38                     |
| 75                               | 9.30                               | 0.48                               | -0.00                               | 3090.00                             | -0.00                              | 5.12                                | 6.73                    | 0.35                    | -0.00                    | 2234.07                  | -0.00                   | 3.70                     |
| 100                              | 9.87                               | 1.03                               | -0.00                               | 3080.00                             | -0.00                              | 5.27                                | 7.47                    | 0.78                    | -0.00                    | 2331.56                  | -0.00                   | 3.99                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|     |        |           |       |        |        |        |
|-----|--------|-----------|-------|--------|--------|--------|
| 24  | 80.009 | 26343.789 | 6.008 | -0.000 | -0.000 | 41.258 |
| 50  | 42.070 | 14008.266 | 7.838 | -0.000 | -0.000 | 22.363 |
| 75  | 29.771 | 9889.637  | 1.549 | -0.000 | -0.000 | 16.390 |
| 100 | 24.723 | 7712.738  | 2.579 | -0.000 | -0.000 | 13.192 |

DATE: 9/25/71

TEST ORGANIZATION: AIRSEARCH

ENGINE SUPPLIER: AIRSEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 84 ENGINE TYPE AND MODEL: GTCP660-4

SERIAL NUMBER: P-37705

RATED SHAFT HORSEPOWER: 300.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5

FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 98.00 FINISH 98.00

ATMOSPHERIC PRESSURE: START 28.58 FINISH 28.58

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0031

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SFC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |                    | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 22/ 0        | 302.10      | 669.65             | 20000.00               | -0.00 | 962.00                             | -0.00                         | 0.015900                         | 98.00                                    | 51.00                                       | 496.27                  |
| 19/22        | 225.90      | 676.99             | 20000.00               | -0.00 | 932.00                             | -0.00                         | 0.016200                         | 97.00                                    | 49.90                                       | 513.21                  |
| 15/19        | 149.80      | 685.29             | 20000.00               | -0.00 | 907.00                             | -0.00                         | 0.016300                         | 98.00                                    | 48.70                                       | 531.06                  |
| 10/15        | 74.90       | 698.22             | 2000.00                | -0.00 | 885.00                             | -0.00                         | 0.016700                         | 100.00                                   | 47.30                                       | 555.03                  |
| 5/10         | 0.0         | 698.09             | 20000.00               | -0.00 | 857.00                             | -0.00                         | 0.016400                         | 99.00                                    | 46.00                                       | 571.89                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 100                              | 1202.00                             | -0.00                              | 167.50              | 3.23                          | 13.90                | 51.00               | 9.30                     | 60.30                    | -0.00     | -0.00 | -0.00        |
| 75                               | 1192.00                             | -0.00                              | 174.20              | 3.30                          | 26.70                | 50.40               | 9.90                     | 60.20                    | -0.00     | -0.00 | -0.00        |
| 49                               | 1183.00                             | -0.00                              | 177.10              | 3.32                          | 15.00                | 53.90               | 10.90                    | 64.80                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1172.00                             | -0.00                              | 191.40              | 3.39                          | 28.40                | 56.80               | 11.00                    | 67.80                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1162.00                             | -0.00                              | 197.30              | 3.34                          | 23.90                | 54.60               | 11.40                    | 66.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 100                              | 10.05                              | 0.48                               | -0.00                               | 3050.00                             | -0.00                              | 5.94                                | 9.67                    | 0.46                    | -0.00                    | 2934.10                  | -0.00                   | 5.72                     |
| 75                               | 10.24                              | 0.90                               | -0.00                               | 3050.00                             | -0.00                              | 5.81                                | 9.54                    | 0.84                    | -0.00                    | 2842.60                  | -0.00                   | 5.42                     |
| 49                               | 10.34                              | 0.50                               | -0.00                               | 3050.00                             | -0.00                              | 6.22                                | 9.38                    | 0.45                    | -0.00                    | 2766.35                  | -0.00                   | 5.64                     |
| 24                               | 10.93                              | 0.93                               | -0.00                               | 3040.00                             | -0.00                              | 6.36                                | 9.68                    | 0.82                    | -0.00                    | 2690.40                  | -0.00                   | 5.63                     |
| 0                                | 11.45                              | 0.79                               | -0.00                               | 3040.00                             | -0.00                              | 6.29                                | 9.81                    | 0.69                    | -0.00                    | 2605.28                  | -0.00                   | 5.39                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 100                              | 9.952             | 3019.409               | 0.471              | -0.000            | -0.000                 | 5.884                  |
| 75                               | 10.569            | 3148.351               | 0.927              | -0.000            | -0.000                 | 6.003                  |
| 49                               | 11.236            | 3312.624               | 0.544              | -0.000            | -0.000                 | 6.756                  |
| 24                               | 12.517            | 3479.941               | 1.061              | -0.000            | -0.000                 | 7.285                  |
| 0                                | 14.054            | 3732.031               | 0.972              | -0.000            | -0.000                 | 7.729                  |

DATE: 9/29/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 40 ENGINE TYPE AND MODEL: TSCP700-4 SERIAL NUMBER: P-90122

RATED SHAFT HORSEPOWER: 142.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 93.00 FINISH 93.00

ATMOSPHERIC PRESSURE: START 28.66 FINISH 28.66

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0037

RELATIVE HUMIDITY: 18.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

STANDBY MODE, SHP ONLY, SURGE VALVE OPEN

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |     |
|--------------|-------------|--------------------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|-----|
| 1/ 0         | 0.0         | 0.0                | 17680.00               | 35350.00                           | 225.00                        | -0.00                            | 0.011300                                 | 78.00                                       | 37.70                   | 0.0 |
| 2/ 1         | 0.0         | 0.0                | 24890.00               | 35950.00                           | 337.00                        | -0.00                            | 0.011300                                 | 89.00                                       | 101.00                  | 0.0 |
| 6/ 2         | 36.00       | 0.0                | 25000.00               | 35830.00                           | 371.00                        | -0.00                            | 0.011800                                 | 92.00                                       | 104.00                  | 0.0 |
| 11/ 6        | 70.70       | 0.0                | 25600.00               | 35800.00                           | 394.00                        | -0.00                            | 0.012200                                 | 99.00                                       | 106.90                  | 0.0 |
| 16/11        | 104.00      | 0.0                | 25900.00               | 35750.00                           | 417.50                        | -0.00                            | 0.012700                                 | 100.00                                      | 108.90                  | 0.0 |
| 20/16        | 141.00      | 0.0                | 26400.00               | 35690.00                           | 442.00                        | -0.00                            | 0.013900                                 | 98.00                                       | 110.80                  | 0.0 |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 819.00                              | -0.00                              | 251.70              | 2.28                          | 160.00               | 22.50               | 12.90                    | 35.40                    | -0.00     | -0.00 | -0.00        |
| 0                                | 777.00                              | -0.00                              | 78.70               | 2.32                          | 98.40                | 52.40               | 11.70                    | 64.30                    | -0.00     | -0.00 | -0.00        |
| 25                               | 800.00                              | -0.00                              | 55.80               | 2.41                          | 63.80                | 53.60               | 8.40                     | 62.00                    | -0.00     | -0.00 | -0.00        |
| 49                               | 833.00                              | -0.00                              | 40.40               | 2.50                          | 53.60                | 62.80               | 7.00                     | 69.80                    | -0.00     | -0.00 | -0.00        |
| 73                               | 858.00                              | -0.00                              | 30.50               | 2.60                          | 61.60                | 71.20               | 6.20                     | 77.40                    | -0.00     | -0.00 | -0.00        |
| 99                               | 893.00                              | -0.00                              | 25.00               | 2.77                          | 60.50                | 72.80               | 16.50                    | 89.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 21.33                              | 7.75                               | -0.00                               | 3040.00                             | -0.00                              | 4.93                                | 4.80                    | 1.74                    | -0.00                    | 684.00                   | -0.00                   | 1.11                     |
| 0                                | 6.64                               | 2.82                               | -0.00                               | 3080.00                             | -0.00                              | 8.91                                | 2.24                    | 0.95                    | -0.00                    | 1037.96                  | -0.00                   | 3.00                     |
| 25                               | 4.52                               | 2.96                               | -0.00                               | 3080.00                             | -0.00                              | 8.26                                | 1.68                    | 1.10                    | -0.00                    | 1142.68                  | -0.00                   | 3.06                     |
| 49                               | 3.17                               | 2.40                               | -0.00                               | 3080.00                             | -0.00                              | 8.98                                | 1.25                    | 0.95                    | -0.00                    | 1213.52                  | -0.00                   | 3.54                     |
| 73                               | 2.29                               | 2.65                               | -0.00                               | 3080.00                             | -0.00                              | 9.56                                | 0.96                    | 1.11                    | -0.00                    | 1285.90                  | -0.00                   | 3.99                     |
| 99                               | 1.76                               | 2.44                               | -0.00                               | 3070.00                             | -0.00                              | 10.36                               | 0.78                    | 1.08                    | -0.00                    | 1356.94                  | -0.00                   | 4.58                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |        |        |        |        |
|----|--------|-----------|--------|--------|--------|--------|
| 25 | 46.602 | 31741.105 | 30.494 | -0.000 | -0.000 | 85.124 |
| 49 | 17.644 | 17164.352 | 13.369 | -0.000 | -0.000 | 50.050 |
| 73 | 9.201  | 12364.422 | 10.634 | -0.000 | -0.000 | 38.386 |
| 99 | 5.530  | 9623.684  | 7.661  | -0.000 | -0.000 | 32.489 |

DATE: 9/25/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 85 ENGINE TYPE AND MODEL: TSCP700-4 SERIAL NUMBER: P-90122

RATED SHAFT HORSEPOWER: 142.

ENGINE TOTAL TIME: 0. MRS

TIME SINCE HOT SECTION OVERHAUL: 0. MRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. MRS

N2 COMPRESSOR OVERHAUL: 0. MRS

COMBUSTOR CAN REPLACEMENT: 0. MRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. MRS

N1 TURBINE OVERHAUL: 0. MRS

N2 TURBINE OVERHAUL: 0. MRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 28.66 FINISH 28.66

INLET AIR HUMIDITY, LBS H2O/LR AIR: 0.0037

RELATIVE HUMIDITY: 18.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

NORMAL MODE, COMBINATION LOAD

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1       | N2     | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS FLOW<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LR/MIN |
|--------------|----------------------|-----------|------------------------|----------|--------|------------------------------------|--------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 139.60               | 1171.89   | 27300.00               | 35350.00 | 495.50 | -0.00                              | 0.015200                       | 90.00                            | 111.30                                   | 480.26                                      |                         |
| 19/22        | 102.80               | 1191.55   | 27300.00               | 35350.00 | 487.00 | -0.00                              | 0.015200                       | 89.00                            | 109.40                                   | 494.73                                      |                         |
| 15/19        | 69.80                | 1198.68   | 27300.00               | 35350.00 | 477.00 | -0.00                              | 0.015200                       | 87.00                            | 108.50                                   | 502.22                                      |                         |
| 10/15        | 35.50                | 1203.58   | 27300.00               | 35350.00 | 469.00 | -0.00                              | 0.015300                       | 86.00                            | 106.90                                   | 510.16                                      |                         |
| 5/10         | 0.0                  | 1197.28   | 27300.00               | 25250.00 | 467.00 | -0.00                              | 0.015500                       | 85.00                            | 104.50                                   | 516.13                                      |                         |
| 25/ 5        | 0.0                  | 1033.62   | 28100.00               | 35350.00 | 467.00 | -0.00                              | 0.013000                       | 93.00                            | 125.10                                   | 391.08                                      |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 98                               | 1005.00                             | -0.00                              | 23.80               | 3.11                          | 65.50                | 97.50               | 3.80                     | 101.30                   | -0.00     | -0.00 | -0.00        |
| 72                               | 1005.00                             | -0.00                              | 20.40               | 3.10                          | 75.30                | 109.30              | 4.40                     | 113.70                   | -0.00     | -0.00 | -0.00        |
| 49                               | 1005.00                             | -0.00                              | 20.40               | 3.10                          | 69.60                | 90.80               | 3.50                     | 94.30                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1005.00                             | -0.00                              | 22.70               | 3.12                          | 81.50                | 95.70               | 4.00                     | 99.70                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1005.00                             | -0.00                              | 22.60               | 3.19                          | 62.30                | 92.10               | 3.50                     | 95.50                    | -0.00     | -0.00 | -0.00        |
| 0                                | 887.00                              | -0.00                              | 26.10               | 2.66                          | 74.90                | 93.20               | 5.70                     | 98.90                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/LK<br>LR FUEL | MASS EMI<br>HC<br>LB/LK<br>LR FUEL | MASS EMI<br>NO2<br>LB/LK<br>LR FUEL | MASS EMI<br>CO2<br>LB/LK<br>LR FUEL | MASS EMI<br>NO<br>LB/LK<br>LR FUEL | MASS EMI<br>NOX<br>LB/LK<br>LR FUEL | MASS EMI<br>CO<br>LB/HP | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HP | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 98                               | 1.49                               | 2.35                               | -0.00                               | 3060.00                             | -0.00                              | 10.43                               | 0.74                    | 1.16                    | -0.00                    | 1516.23                  | -0.00                   | 5.17                     |
| 72                               | 1.28                               | 2.70                               | -0.00                               | 3060.00                             | -0.00                              | 11.72                               | 0.62                    | 1.32                    | -0.00                    | 1490.22                  | -0.00                   | 5.71                     |
| 49                               | 1.28                               | 2.50                               | -0.00                               | 3060.00                             | -0.00                              | 9.73                                | 0.61                    | 1.19                    | -0.00                    | 1459.62                  | -0.00                   | 4.64                     |
| 25                               | 1.41                               | 2.90                               | -0.00                               | 3060.00                             | -0.00                              | 10.22                               | 0.66                    | 1.36                    | -0.00                    | 1435.14                  | -0.00                   | 4.79                     |
| 0                                | 1.19                               | 2.18                               | -0.00                               | 3090.00                             | -0.00                              | 9.67                                | 0.65                    | 1.02                    | -0.00                    | 1443.03                  | -0.00                   | 4.49                     |
| 0                                | 1.92                               | 3.15                               | -0.00                               | 3070.00                             | -0.00                              | 11.96                               | 0.90                    | 1.47                    | -0.00                    | 1433.69                  | -0.00                   | 5.59                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/LK HP-HR | CO<br>2<br>LB/LK HP-HR | THC<br>LB/LK HP-HR | NO<br>LB/LK HP-HR | NO<br>2<br>LB/LK HP-HR | NO<br>X<br>LB/LK HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 98                               | 0.563             | 1156.111               | 0.887              | -0.000            | -0.000                 | 3.942                  |
| 72                               | 0.483             | 1151.326               | 1.017              | -0.000            | -0.000                 | 4.411                  |
| 49                               | 0.483             | 1150.686               | 0.939              | -0.000            | -0.000                 | 3.658                  |
| 25                               | 0.535             | 1158.231               | 1.100              | -0.000            | -0.000                 | 3.867                  |
| 0                                | 0.541             | 1205.256               | 0.852              | -0.000            | -0.000                 | 3.752                  |
| 0                                | 0.868             | 1387.052               | 1.474              | -0.000            | -0.000                 | 5.404                  |

DATE: 9/27/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 41 ENGINE TYPE AND MODEL: TSCPT00-4 SERIAL NUMBER: P-90123  
RATED SHAFT HORSEPOWER: 142.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 97.00 FINISH 97.00

ATMOSPHERIC PRESSURE: START 28.72 FINISH 28.72

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0041

RELATIVE HUMIDITY: 18.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

STANDBY MODE, SHP ONLY, SURGE VALVE OPEN

| TEST MODE | SHAFT HP | POWER HP | AIR HP | ENGINE SPEED RPM | N1       | N2     | CORRECTED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | F/A CALC FROM EMISSIONS | COMPRESSOR INLET TEMP DEGREES F | COMPRESSOR DISCHARGE PRESSURE PSIA | BLEED FLOW LB/MIN |
|-----------|----------|----------|--------|------------------|----------|--------|---------------------------|-------------------------|-------------------------|---------------------------------|------------------------------------|-------------------|
| 1/ 0      | 0.0      | 0.0      | 0.0    | 17650.00         | 35440.00 | 228.00 | -0.00                     | 0.011600                | 82.00                   | 59.10                           | 0.0                                |                   |
| 2/ 1      | 0.0      | 0.0      | 0.0    | 28100.00         | 35000.00 | 481.00 | -0.00                     | 0.014000                | 100.00                  | 115.10                          | 0.0                                |                   |
| 6/ 2      | 34.80    | 0.0      | 0.0    | 27800.00         | 34650.00 | 482.00 | -0.00                     | 0.014600                | 103.00                  | 114.00                          | 0.0                                |                   |
| 11/ 6     | 68.40    | 0.0      | 0.0    | 25550.00         | 34650.00 | 409.00 | -0.00                     | 0.012700                | 96.00                   | 102.10                          | 0.0                                |                   |
| 16/11     | 103.90   | 0.0      | 0.0    | 26270.00         | 35730.00 | 436.00 | -0.00                     | 0.013300                | 102.00                  | 106.10                          | 0.0                                |                   |
| 20/16     | 141.10   | 0.0      | 0.0    | 26750.00         | 35720.00 | 469.00 | -0.00                     | 0.014300                | 100.00                  | 110.10                          | 0.0                                |                   |

| POWER PERCENT RATED SHP | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                       | 842.00                     | -0.00                     | 193.20        | 2.35                 | 69.50          | 20.80         | 12.60           | 33.40           | -0.00     | -0.00 | -0.00        |
| 0                       | 939.00                     | -0.00                     | 16.00         | 2.88                 | 31.00          | 45.20         | 1.40            | 46.50           | -0.00     | -0.00 | -0.00        |
| 24                      | 979.00                     | -0.00                     | 18.80         | 2.99                 | 55.60          | 46.50         | 2.10            | 48.60           | -0.00     | -0.00 | -0.00        |
| 48                      | 884.00                     | -0.00                     | 22.20         | 2.61                 | 18.10          | 44.60         | 3.70            | 48.30           | -0.00     | -0.00 | -0.00        |
| 73                      | 929.00                     | -0.00                     | 18.90         | 2.73                 | 40.90          | 52.10         | 2.80            | 54.90           | -0.00     | -0.00 | -0.00        |
| 99                      | 956.00                     | -0.00                     | 14.80         | 2.92                 | 43.60          | 60.40         | 3.30            | 63.70           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED SHP | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|-------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                       | 15.98                     | 3.28                      | -0.00                      | 3060.00                    | -0.00                     | 4.54                       | 3.64              | 0.75              | -0.00              | 697.68             | -0.00             | 1.04               |
| 0                       | 1.09                      | 1.20                      | -0.00                      | 3070.00                    | -0.00                     | 5.20                       | 0.52              | 0.58              | -0.00              | 1476.67            | -0.00             | 2.50               |
| 24                      | 1.23                      | 2.07                      | -0.00                      | 3070.00                    | -0.00                     | 5.21                       | 0.59              | 1.00              | -0.00              | 1479.74            | -0.00             | 2.51               |
| 48                      | 1.67                      | 0.78                      | -0.00                      | 3080.00                    | -0.00                     | 5.96                       | 0.68              | 0.32              | -0.00              | 1259.72            | -0.00             | 2.44               |
| 73                      | 1.35                      | 1.68                      | -0.00                      | 3080.00                    | -0.00                     | 6.48                       | 0.59              | 0.73              | -0.00              | 1342.88            | -0.00             | 2.82               |
| 99                      | 0.99                      | 1.67                      | -0.00                      | 3070.00                    | -0.00                     | 6.99                       | 0.46              | 0.78              | -0.00              | 1439.83            | -0.00             | 3.28               |

| POWER PERCENT RATED SHP | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |        |        |        |        |
|----|--------|-----------|--------|--------|--------|--------|
| 24 | 17.022 | 42521.270 | 28.740 | -0.000 | -0.000 | 72.203 |
| 48 | 9.998  | 18416.957 | 4.658  | -0.000 | -0.000 | 35.644 |
| 73 | 5.686  | 12924.734 | 7.050  | -0.000 | -0.000 | 27.188 |
| 99 | 3.291  | 10204.320 | 5.541  | -0.000 | -0.000 | 23.241 |

DATE: 5/27/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 96 ENGINE TYPE AND MODEL: TSCP700-4 SERIAL NUMBER: P-90123

RATED SHAFT HORSEPOWER: 142.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 28.72 FINISH 28.72

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0041

RELATIVE HUMIDITY: 18.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

NORMAL MODE, COMBINATION LOAD

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>MP | ENGINE<br>SPEED<br>RPM | ENGINE<br>N1 | ENGINE<br>N2 | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|--------------|--------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 140.00               | 1083.37   | 27300.00               | 35440.00     | 497.00       | -0.00                              | 0.015300                      | 89.00                            | 109.80                                   | 448.74                                      |                         |
| 19/22        | 103.10               | 1113.33   | 27300.00               | 35440.00     | 489.00       | -0.00                              | 0.014900                      | 89.00                            | 108.60                                   | 464.48                                      |                         |
| 15/19        | 70.00                | 1131.67   | 27300.00               | 35440.00     | 481.00       | -0.00                              | 0.014900                      | 89.00                            | 107.90                                   | 474.14                                      |                         |
| 10/15        | 35.60                | 1137.60   | 27300.00               | 35440.00     | 471.00       | -0.00                              | 0.015100                      | 87.00                            | 104.40                                   | 488.92                                      |                         |
| 5/10         | 0.0                  | 1097.85   | 27340.00               | 35440.00     | 460.00       | -0.00                              | 0.015200                      | 87.00                            | 102.60                                   | 477.35                                      |                         |
| 25/ 5        | 0.0                  | 1058.37   | 28100.00               | 35440.00     | 474.00       | -0.00                              | 0.013700                      | 91.00                            | 116.50                                   | 420.39                                      |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 98                               | 1005.00                             | -0.00                              | 21.00               | 3.14                          | 24.50                | 83.70               | 0.40                     | 84.10                    | -0.00     | -0.00 | -0.00        |
| 72                               | 1005.00                             | -0.00                              | 19.40               | 3.04                          | 31.40                | 79.10               | 3.40                     | 82.50                    | -0.00     | -0.00 | -0.00        |
| 49                               | 1005.00                             | -0.00                              | 22.10               | 3.06                          | 28.80                | 76.10               | 3.60                     | 79.70                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1005.00                             | -0.00                              | 19.30               | 3.09                          | 38.80                | 75.80               | 3.40                     | 79.20                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1005.00                             | -0.00                              | 48.60               | 3.11                          | 39.90                | 76.60               | 3.20                     | 79.80                    | -0.00     | -0.00 | -0.00        |
| 0                                | 908.00                              | -0.00                              | 27.70               | 2.81                          | 23.60                | 75.00               | 4.10                     | 79.10                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 98                               | 1.30                               | 0.87                               | -0.00                               | 3070.00                             | -0.00                              | 8.58                                | 0.65                    | 0.43                    | -0.00                    | 1525.79                  | -0.00                   | 4.26                     |
| 72                               | 1.24                               | 1.15                               | -0.00                               | 3070.00                             | -0.00                              | 8.69                                | 0.61                    | 0.56                    | -0.00                    | 1501.23                  | -0.00                   | 4.25                     |
| 49                               | 1.41                               | 1.05                               | -0.00                               | 3070.00                             | -0.00                              | 8.36                                | 0.68                    | 0.51                    | -0.00                    | 1476.67                  | -0.00                   | 4.02                     |
| 25                               | 1.22                               | 1.40                               | -0.00                               | 3070.00                             | -0.00                              | 8.20                                | 0.57                    | 0.66                    | -0.00                    | 1445.97                  | -0.00                   | 3.86                     |
| 0                                | 3.05                               | 1.43                               | -0.00                               | 3060.00                             | -0.00                              | 8.21                                | 1.40                    | 0.66                    | -0.00                    | 1407.60                  | -0.00                   | 3.77                     |
| 0                                | 1.93                               | 0.94                               | -0.00                               | 3070.00                             | -0.00                              | 9.05                                | 0.91                    | 0.44                    | -0.00                    | 1455.18                  | -0.00                   | 4.29                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 98                               | 0.530             | 1247.206               | 0.353              | -0.000            | -0.000                 | 3.494                  |
| 72                               | 0.499             | 1234.129               | 0.463              | -0.000            | -0.000                 | 3.493                  |
| 49                               | 0.566             | 1228.853               | 0.421              | -0.000            | -0.000                 | 3.347                  |
| 25                               | 0.490             | 1232.504               | 0.562              | -0.000            | -0.000                 | 3.292                  |
| 0                                | 1.276             | 1282.145               | 0.598              | -0.000            | -0.000                 | 3.438                  |
| 0                                | 0.863             | 1374.920               | 0.420              | -0.000            | -0.000                 | 4.051                  |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 42 ENGINE TYPE AND MODEL: GTCPS-180

SERIAL NUMBER: P-56T

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. MRS

TIME SINCE HOT SECTION OVERHAUL: 0. MRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. MRS

N2 COMPRESSOR OVERHAUL: 0. MRS

COMBUSTOR CAN REPLACEMENT: 0. MRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. MRS

N1 TURBINE OVERHAUL: 0. MRS

N2 TURBINE OVERHAUL: 0. MRS

FUEL: AV KERO

FUEL W/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 101.00 FINISH 101.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0050

RELATIVE HUMIDITY: 12.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SMP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0                | 41700.00               | -0.00 | -0.00 | 122.80                             | -0.00                         | 0.006900                         | 95.00                                    | 55.60                                       | 0.0                     |
| 6/ 1         | 39.90       | 0.0                | 41600.00               | -0.00 | -0.00 | 137.00                             | -0.00                         | 0.007900                         | 100.00                                   | 55.10                                       | 0.0                     |
| 11/ 6        | 78.50       | 0.0                | 41400.00               | -0.00 | -0.00 | 155.00                             | -0.00                         | 0.009100                         | 102.00                                   | 54.80                                       | 0.0                     |
| 16/11        | 116.90      | 0.0                | 41300.00               | -0.00 | -0.00 | 177.00                             | -0.00                         | 0.010500                         | 102.00                                   | 54.40                                       | 0.0                     |
| 20/16        | 194.90      | 0.0                | 41100.00               | -0.00 | -0.00 | 207.00                             | -0.00                         | 0.011900                         | 104.00                                   | 53.60                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 515.00                              | -0.00                              | 146.80              | 1.41                          | 26.30                | 12.00               | 6.70                     | 18.70                    | -0.00     | -0.00 | -0.00        |
| 24                               | 585.00                              | -0.00                              | 160.90              | 1.62                          | 24.70                | 14.40               | 8.20                     | 22.70                    | -0.00     | -0.00 | -0.00        |
| 49                               | 655.00                              | -0.00                              | 180.80              | 1.85                          | 20.80                | 20.10               | 0.40                     | 28.50                    | -0.00     | -0.00 | -0.00        |
| 73                               | 730.00                              | -0.00                              | 200.20              | 2.13                          | 18.20                | 22.00               | 10.40                    | 32.40                    | -0.00     | -0.00 | -0.00        |
| 96                               | 815.00                              | -0.00                              | 235.70              | 2.42                          | 27.30                | 26.50               | 11.60                    | 38.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 20.29                              | 2.07                               | -0.00                               | 3070.00                             | -0.00                              | 4.25                                | 2.49                    | 0.25                    | -0.00                    | 377.00                   | -0.00                   | 0.52                     |
| 24                               | 19.42                              | 1.70                               | -0.00                               | 3070.00                             | -0.00                              | 4.49                                | 2.66                    | 0.23                    | -0.00                    | 420.59                   | -0.00                   | 0.62                     |
| 49                               | 19.01                              | 1.25                               | -0.00                               | 3060.00                             | -0.00                              | 4.92                                | 2.95                    | 0.19                    | -0.00                    | 474.30                   | -0.00                   | 0.76                     |
| 73                               | 18.33                              | 0.95                               | -0.00                               | 3060.00                             | -0.00                              | 4.88                                | 3.24                    | 0.17                    | -0.00                    | 541.62                   | -0.00                   | 0.86                     |
| 96                               | 18.92                              | 1.25                               | -0.00                               | 3050.00                             | -0.00                              | 5.01                                | 3.92                    | 0.26                    | -0.00                    | 631.35                   | -0.00                   | 1.04                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |       |        |        |        |
|----|--------|-----------|-------|--------|--------|--------|
| 24 | 66.694 | 10541.094 | 5.841 | -0.000 | -0.000 | 15.431 |
| 49 | 37.538 | 6042.031  | 2.470 | -0.000 | -0.000 | 9.723  |
| 73 | 27.748 | 4633.188  | 1.444 | -0.000 | -0.000 | 7.384  |
| 96 | 25.278 | 4075.854  | 1.674 | -0.000 | -0.000 | 6.702  |

DATE: 6/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 95 ENGINE TYPE AND MODEL: GTCPS-180

SERIAL NUMBR: P-567

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROZ FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 110.00 FINISH 110.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0050

RELATIVE HUMIDITY: 12.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GFN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |                    | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 27/ 0        | 154.50      | 88.96              | 41000.00               | -0.00 | 279.50                             | -0.00                         | 0.016800                         | 107.00                                   | 50.00                                       | 66.12                   |
| 19/22        | 115.60      | 114.77             | 41000.00               | -0.00 | 272.50                             | -0.00                         | 0.015700                         | 110.00                                   | 49.00                                       | 86.54                   |
| 15/19        | 77.90       | 129.21             | 41100.00               | -0.00 | 262.50                             | -0.00                         | 0.015600                         | 111.00                                   | 47.50                                       | 100.31                  |
| 10/15        | 39.00       | 144.10             | 41200.00               | -0.00 | 251.50                             | -0.00                         | 0.016200                         | 110.00                                   | 46.00                                       | 115.77                  |
| 5/10         | 0.0         | 159.30             | 41200.00               | -0.00 | 241.50                             | -0.00                         | 0.016700                         | 114.00                                   | 44.10                                       | 132.81                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 96                               | 1150.00                             | -0.00                              | 222.90              | 3.40                          | 6.80                 | 44.70               | 10.50                    | 55.10                    | -0.00     | -0.00 | -0.00        |
| 72                               | 1150.00                             | -0.00                              | 252.10              | 3.17                          | 7.60                 | 40.30               | 11.80                    | 52.10                    | -0.00     | -0.00 | -0.00        |
| 48                               | 1150.00                             | -0.00                              | 577.90              | 3.16                          | 8.50                 | 37.30               | 13.80                    | 51.50                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1150.00                             | -0.00                              | 261.80              | 3.27                          | 6.60                 | 42.10               | 11.90                    | 54.00                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1150.00                             | -0.00                              | 248.40              | 3.38                          | 5.60                 | 44.60               | 11.90                    | 55.50                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 96                               | 12.64                              | 0.22                               | -0.00                               | 3030.00                             | -0.00                              | 5.14                                | 3.53                    | 0.06                    | -0.00                    | 846.88                   | -0.00                   | 1.44                     |
| 72                               | 15.33                              | 0.26                               | -0.00                               | 3030.00                             | -0.00                              | 5.21                                | 4.18                    | 0.07                    | -0.00                    | 825.67                   | -0.00                   | 1.42                     |
| 48                               | 16.93                              | 0.30                               | -0.00                               | 3030.00                             | -0.00                              | 5.11                                | 4.44                    | 0.08                    | -0.00                    | 795.37                   | -0.00                   | 1.34                     |
| 24                               | 15.40                              | 0.22                               | -0.00                               | 3030.00                             | -0.00                              | 5.22                                | 3.97                    | 0.06                    | -0.00                    | 767.04                   | -0.00                   | 1.31                     |
| 0                                | 14.13                              | 0.18                               | -0.00                               | 3020.00                             | -0.00                              | 5.19                                | 3.41                    | 0.04                    | -0.00                    | 729.13                   | -0.00                   | 1.25                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
|                                  |                      |                           |                       |                      |                           |                           |
| 96                               | 14.514               | 3478.560                  | 0.253                 | -0.000               | -0.000                    | 5.897                     |
| 72                               | 18.132               | 3584.189                  | 0.311                 | -0.000               | -0.000                    | 6.161                     |
| 48                               | 21.455               | 3840.286                  | 0.376                 | -0.000               | -0.000                    | 6.480                     |
| 24                               | 21.156               | 4161.965                  | 0.306                 | -0.000               | -0.000                    | 7.169                     |
| 0                                | 21.421               | 4578.332                  | 0.279                 | -0.000               | -0.000                    | 7.862                     |

DATE: 8/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 43 ENGINE TYPE AND MODEL: GTCB9-180 SERIAL NUMBER: P-907

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROZ FUEL W/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 104.00 FINISH 104.00

ATMOSPHERIC PRESSURE: START 28.58 FINISH 28.58

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0052

RELATIVE HUMIDITY: 12.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |             |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
|              |             |             |           |                        |       |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         |             | 0.0       | 41700.00               | -0.00 | 116.00                             | -0.00                         | 0.006500                         | 105.00                                   | 54.20                                       | 0.0                     |
| 6/ 1         | 39.50       |             | 0.0       | 41400.00               | -0.00 | 134.00                             | -0.00                         | 0.007700                         | 104.00                                   | 53.20                                       | 0.0                     |
| 11/ 6        | 79.00       |             | 0.0       | 41400.00               | -0.00 | 153.00                             | -0.00                         | 0.008700                         | 104.00                                   | 53.20                                       | 0.0                     |
| 16/11        | 119.30      |             | 0.0       | 41100.00               | -0.00 | 175.00                             | -0.00                         | 0.010200                         | 104.00                                   | 53.30                                       | 0.0                     |
| 20/16        | 157.80      |             | 0.0       | 41000.00               | -0.00 | 194.00                             | -0.00                         | 0.011600                         | 104.00                                   | 53.30                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|--|--|--|--|--|--|--|--|--|--|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |  |  |  |
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |  |  |  |
| 0                                | 510.00                              | -0.00                              | 125.30              | 1.33                          | 16.90                | 11.40               | 5.90                     | 17.30                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 24                               | 580.00                              | -0.00                              | 128.10              | 1.56                          | 12.40                | 14.90               | 7.30                     | 22.20                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 49                               | 645.00                              | -0.00                              | 140.40              | 1.78                          | 11.50                | 17.70               | 8.50                     | 26.20                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 74                               | 710.00                              | -0.00                              | 152.80              | 2.07                          | 8.70                 | 22.40               | 10.30                    | 32.60                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 98                               | 790.00                              | -0.00                              | 177.30              | 2.35                          | 7.10                 | 27.20               | 10.90                    | 38.10                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 0                                | 18.45                              | 1.42                               | -0.00                               | 3080.00                             | -0.00                              | 4.19                                | 2.14                    | 0.17                    | -0.00                    | 357.28                   | -0.00                   | 0.49                     |
| 24                               | 16.05                              | 0.89                               | -0.00                               | 3080.00                             | -0.00                              | 4.57                                | 2.15                    | 0.12                    | -0.00                    | 412.72                   | -0.00                   | 0.61                     |
| 49                               | 15.44                              | 0.72                               | -0.00                               | 3070.00                             | -0.00                              | 4.73                                | 2.36                    | 0.11                    | -0.00                    | 469.71                   | -0.00                   | 0.72                     |
| 74                               | 14.38                              | 0.47                               | -0.00                               | 3070.00                             | -0.00                              | 5.04                                | 2.52                    | 0.08                    | -0.00                    | 537.25                   | -0.00                   | 0.88                     |
| 98                               | 14.66                              | 0.33                               | -0.00                               | 3060.00                             | -0.00                              | 5.17                                | 2.84                    | 0.06                    | -0.00                    | 593.64                   | -0.00                   | 1.00                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                              |                   |                        |                    |                   |                        |                        |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 24                                           | 54.434            | 10448.607              | 3.012              | -0.000            | -0.000                 | 15.507                 |
| 49                                           | 29.903            | 5945.695               | 1.398              | -0.000            | -0.000                 | 9.168                  |
| 74                                           | 21.091            | 4503.352               | 0.684              | -0.000            | -0.000                 | 7.396                  |
| 98                                           | 18.018            | 3761.976               | 0.409              | -0.000            | -0.000                 | 6.354                  |

DATE: 6/14/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 94 ENGINE TYPE AND MODEL: GTCPS-180 SERIAL NUMBER: P-507  
RATED SHAFT HORSEPOWER: 160.  
ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: AV KEROZ FUEL H/C RATIO: 1.928

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 107.00 FINISH 107.00  
ATMOSPHERIC PRESSURE: START 28.58 FINISH 28.58  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0052  
RELATIVE HUMIDITY: 12.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2     | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|-------|--------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 156.30               | 93.41     | 40600.00               | -0.00 | 271.50 | -0.00                              | 0.016400                      | 105.00                           | 49.70                                    | 70.08                                       |                         |
| 19/22        | 117.80               | 117.17    | 40600.00               | -0.00 | 271.50 | -0.00                              | 0.016300                      | 107.00                           | 48.60                                    | 89.54                                       |                         |
| 15/19        | 77.40                | 135.59    | 40600.00               | -0.00 | 260.50 | -0.00                              | 0.016200                      | 108.00                           | 46.90                                    | 107.18                                      |                         |
| 10/15        | 38.90                | 152.47    | 40700.00               | -0.00 | 252.50 | -0.00                              | 0.016500                      | 108.00                           | 45.60                                    | 124.04                                      |                         |
| 5/10         | 0.0                  | 161.62    | 40800.00               | -0.00 | 235.00 | -0.00                              | 0.016900                      | 107.00                           | 43.70                                    | 137.74                                      |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 97                               | 1150.00                             | -0.00                              | 174.30              | 33.40                         | 1.00                 | 44.40               | 10.00                    | 54.40                    | -0.00     | -0.00 | -0.00        |
| 73                               | 1150.00                             | -0.00                              | 194.50              | 3.30                          | 2.10                 | 43.50               | 9.40                     | 53.00                    | -0.00     | -0.00 | -0.00        |
| 48                               | 1150.00                             | -0.00                              | 194.60              | 3.29                          | 2.50                 | 41.70               | 10.00                    | 51.70                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1150.00                             | -0.00                              | 198.70              | 3.34                          | 2.20                 | 43.00               | 9.10                     | 52.10                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1150.00                             | -0.00                              | 193.10              | 3.43                          | 2.00                 | 43.20               | 9.50                     | 52.70                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 97                               | 10.08                              | 0.03                               | -0.00                               | 3030.00                             | -0.00                              | 5.16                                | 2.74                    | 0.01                    | -0.00                    | 922.64                   | -0.00                   | 1.40                     |
| 73                               | 11.16                              | 0.07                               | -0.00                               | 3030.00                             | -0.00                              | 5.09                                | 3.08                    | 0.02                    | -0.00                    | 822.64                   | -0.00                   | 1.38                     |
| 48                               | 11.42                              | 0.08                               | -0.00                               | 3030.00                             | -0.00                              | 4.98                                | 2.98                    | 0.02                    | -0.00                    | 789.31                   | -0.00                   | 1.30                     |
| 24                               | 11.48                              | 0.07                               | -0.00                               | 3030.00                             | -0.00                              | 4.94                                | 2.90                    | 0.02                    | -0.00                    | 765.07                   | -0.00                   | 1.25                     |
| 0                                | 10.85                              | 0.06                               | -0.00                               | 3030.00                             | -0.00                              | 4.87                                | 2.55                    | 0.02                    | -0.00                    | 712.05                   | -0.00                   | 1.14                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| 97                               | 10.964               | 3294.440                  | 0.035                 | -0.000               | -0.000                    | 5.416                     |
| 73                               | 13.124               | 3501.055                  | 0.083                 | -0.000               | -0.000                    | 5.871                     |
| 48                               | 13.971               | 3705.883                  | 0.104                 | -0.000               | -0.000                    | 6.096                     |
| 24                               | 15.142               | 3997.856                  | 0.098                 | -0.000               | -0.000                    | 6.515                     |
| 0                                | 15.780               | 4405.586                  | 0.093                 | -0.000               | -0.000                    | 7.078                     |

DATE: 6/15/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 44 ENGINE TYPE AND MODEL: GTCPS-100 SERIAL NUMBER: P-518

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROZ FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 97.00 FINISH 97.00

ATMOSPHERIC PRESSURE: START 28.63 FINISH 28.63

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 13.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER     |          | ENGINE<br>SPEED<br>RPM |        | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-----------|----------|------------------------|--------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             | AIR<br>HP |          | N1                     | N2     |                                    |                               |                                  |                                          |                                             |                         |
|              |             |           |          |                        |        |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0       | 41600.00 | -0.00                  | 119.00 | -0.00                              | 0.006800                      | 96.00                            | 54.80                                    | 0.0                                         |                         |
| 6/ 1         | 40.80       | 0.0       | 41500.00 | -0.00                  | 138.00 | -0.00                              | 0.007900                      | 96.00                            | 54.60                                    | 0.0                                         |                         |
| 11/ 6        | 79.30       | 0.0       | 41300.00 | -0.00                  | 157.00 | -0.00                              | 0.009200                      | 98.00                            | 53.90                                    | 0.0                                         |                         |
| 16/11        | 118.30      | 0.0       | 41100.00 | -0.00                  | 176.00 | -0.00                              | 0.010400                      | 98.00                            | 53.50                                    | 0.0                                         |                         |
| 20/16        | 158.30      | 0.0       | 41000.00 | -0.00                  | 201.50 | -0.00                              | 0.012200                      | 99.00                            | 53.00                                    | 0.0                                         |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 0                                | 490.00                              | -0.00                              | 160.80              | 1.39                          | 4.00                 | 8.40                | 8.80                     | 17.20                    | -0.00     | -0.00 | -0.00        |
| 25                               | 565.00                              | -0.00                              | 199.00              | 1.61                          | 5.10                 | 10.20               | 11.50                    | 21.70                    | -0.00     | -0.00 | -0.00        |
| 49                               | 635.00                              | -0.00                              | 255.30              | 1.87                          | 6.30                 | 12.50               | 12.70                    | 25.20                    | -0.00     | -0.00 | -0.00        |
| 73                               | 710.00                              | -0.00                              | 266.10              | 2.10                          | 5.30                 | 15.40               | 15.50                    | 30.90                    | -0.00     | -0.00 | -0.00        |
| 98                               | 805.00                              | -0.00                              | 311.50              | 2.47                          | 4.30                 | 19.50               | 14.40                    | 34.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 0                                | 22.59                              | 0.32                               | -0.00                               | 3070.00                             | -0.00                              | 3.97                                | 2.69                    | 0.04                    | -0.00                    | 365.33                   | -0.00                   | 0.47                     |
| 25                               | 24.06                              | 0.35                               | -0.00                               | 3060.00                             | -0.00                              | 4.31                                | 3.32                    | 0.05                    | -0.00                    | 422.28                   | -0.00                   | 0.59                     |
| 49                               | 26.48                              | 0.38                               | -0.00                               | 3050.00                             | -0.00                              | 4.29                                | 4.16                    | 0.06                    | -0.00                    | 478.85                   | -0.00                   | 0.67                     |
| 73                               | 24.53                              | 0.28                               | -0.00                               | 3050.00                             | -0.00                              | 4.68                                | 4.32                    | 0.05                    | -0.00                    | 536.80                   | -0.00                   | 0.82                     |
| 98                               | 24.37                              | 0.19                               | -0.00                               | 3040.00                             | -0.00                              | 4.36                                | 4.91                    | 0.04                    | -0.00                    | 612.56                   | -0.00                   | 0.88                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO     |       | CO<br>2   |       | THC   | NO     |       | NO<br>2 |       | NO<br>X |       |
|----------------------------------------------|--------|-------|-----------|-------|-------|--------|-------|---------|-------|---------|-------|
|                                              | LB/1K  | HP-HR | LB/1K     | HP-HR |       | LB/1K  | HP-HR | LB/1K   | HP-HR | LB/1K   | HP-HR |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |        |       |           |       |       |        |       |         |       |         |       |
| 25                                           | 81.369 |       | 10349.992 |       | 1.197 | -0.000 |       | -0.000  |       | 14.581  |       |
| 49                                           | 52.422 |       | 6038.461  |       | 0.744 | -0.000 |       | -0.000  |       | 8.503   |       |
| 73                                           | 36.496 |       | 4537.613  |       | 0.412 | -0.000 |       | -0.000  |       | 6.963   |       |
| 98                                           | 31.015 |       | 3869.614  |       | 0.247 | -0.000 |       | -0.000  |       | 5.554   |       |

DATE: 6/15/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 93 ENGINE TYPE AND MODEL: GTCP85-180 SERIAL NUMBER: P-518

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 109.00 FINISH 109.00

ATMOSPHERIC PRESSURE: START 28.63 FINISH 28.63

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 13.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 156.80               | 97.61     | 40600.00               | -0.00 | -0.00 | 281.50                             | -0.00                         | 0.018700                         | 103.00                                   | 49.80                                       | 73.35                   |
| 19/22        | 117.20               | 117.67    | 40700.00               | -0.00 | -0.00 | 268.50                             | -0.00                         | 0.016900                         | 110.00                                   | 49.00                                       | 88.73                   |
| 15/19        | 78.30                | 134.40    | 40800.00               | -0.00 | -0.00 | 261.50                             | -0.00                         | 0.016600                         | 110.00                                   | 47.70                                       | 104.08                  |
| 10/15        | 39.10                | 151.38    | 40800.00               | -0.00 | -0.00 | 253.50                             | -0.00                         | 0.017000                         | 110.00                                   | 46.40                                       | 120.55                  |
| 5/10         | 0.0                  | 163.84    | 40900.00               | -0.00 | -0.00 | 248.50                             | -0.00                         | 0.017300                         | 110.00                                   | 44.70                                       | 135.61                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 97                               | 1150.00                             | -0.00                              | 187.20              | 3.70                          | 0.60                 | 48.30               | 9.40                     | 57.70                    | -0.00     | -0.00 | -0.00        |
| 73                               | 1150.00                             | -0.00                              | 282.90              | 3.41                          | 7.10                 | 39.80               | 10.20                    | 50.00                    | -0.00     | -0.00 | -0.00        |
| 48                               | 1150.00                             | -0.00                              | 298.20              | 3.36                          | 9.70                 | 36.80               | 12.40                    | 49.30                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1150.00                             | -0.00                              | 314.60              | 3.42                          | 11.10                | 37.00               | 12.10                    | 49.10                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1150.00                             | -0.00                              | 309.40              | 3.48                          | 9.80                 | 37.80               | 11.50                    | 49.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 97                               | 9.74                               | 0.02                               | -0.00                               | 3020.00                             | -0.00                              | 4.93                                | 2.74                    | 0.00                    | -0.00                    | 850.13                   | -0.00                   | 1.39                     |
| 73                               | 15.93                              | 0.23                               | -0.00                               | 3020.00                             | -0.00                              | 4.67                                | 4.28                    | 0.06                    | -0.00                    | 810.87                   | -0.00                   | 1.24                     |
| 48                               | 17.04                              | 0.32                               | -0.00                               | 3020.00                             | -0.00                              | 4.63                                | 4.46                    | 0.08                    | -0.00                    | 789.71                   | -0.00                   | 1.21                     |
| 24                               | 17.64                              | 0.35                               | -0.00                               | 3020.00                             | -0.00                              | 4.53                                | 4.47                    | 0.09                    | -0.00                    | 765.57                   | -0.00                   | 1.15                     |
| 0                                | 17.05                              | 0.31                               | -0.00                               | 3020.00                             | -0.00                              | 4.45                                | 4.24                    | 0.08                    | -0.00                    | 750.47                   | -0.00                   | 1.11                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 97                               | 10.778            | 3141.578               | 0.019              | -0.000            | -0.000                 | 5.454                  |
| 73                               | 18.210            | 3452.418               | 0.262              | -0.000            | -0.000                 | 5.287                  |
| 48                               | 20.956            | 3712.895               | 0.390              | -0.000            | -0.000                 | 5.637                  |
| 24                               | 23.480            | 4019.110               | 0.472              | -0.000            | -0.000                 | 6.025                  |
| 0                                | 25.855            | 4580.398               | 0.469              | -0.000            | -0.000                 | 6.770                  |

DATE: 6/19/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 45 ENGINE TYPE AND MODEL: GTCB85-160 SERIAL NUMBER: P-595

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KERO

FUEL W/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 106.00 FINISH 106.00

ATMOSPHERIC PRESSURE: START 28.64 FINISH 28.64

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM<br>N1 | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0                | 41600.00                     | -0.00 | 114.00                             | -0.00                         | 0.006800                         | 105.00                                   | 53.40                                       | 0.0                     |
| 6/ 1         | 40.70       | 0.0                | 41400.00                     | -0.00 | 133.00                             | -0.00                         | 0.007700                         | 106.00                                   | 52.90                                       | 0.0                     |
| 11/ 6        | 79.10       | 0.0                | 41200.00                     | -0.00 | 153.00                             | -0.00                         | 0.009100                         | 107.00                                   | 52.60                                       | 0.0                     |
| 16/11        | 118.30      | 0.0                | 41100.00                     | -0.00 | 174.00                             | -0.00                         | 0.010300                         | 107.00                                   | 52.40                                       | 0.0                     |
| 20/16        | 157.90      | 0.0                | 40900.00                     | -0.00 | 205.00                             | -0.00                         | 0.012000                         | 107.00                                   | 51.90                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 580.00                              | -0.00                              | 190.90              | 1.38                          | 50.80                | 8.70                | 8.70                     | 17.40                    | -0.00     | -0.00 | -0.00        |
| 25                               | 580.00                              | -0.00                              | 227.30              | 1.55                          | 55.50                | 11.20               | 11.20                    | 22.40                    | -0.00     | -0.00 | -0.00        |
| 49                               | 660.00                              | -0.00                              | 273.00              | 1.83                          | 56.30                | 13.10               | 12.50                    | 25.60                    | -0.00     | -0.00 | -0.00        |
| 73                               | 740.00                              | -0.00                              | 261.20              | 2.08                          | 49.00                | 17.30               | 14.10                    | 31.30                    | -0.00     | -0.00 | -0.00        |
| 98                               | 850.00                              | -0.00                              | 288.30              | 2.42                          | 36.90                | 23.30               | 15.30                    | 38.60                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 27.00                              | 4.10                               | -0.00                               | 3060.00                             | -0.00                              | 4.03                                | 3.08                    | 0.47                    | -0.00                    | 348.84                   | -0.00                   | 0.46                     |
| 25                               | 28.51                              | 3.98                               | -0.00                               | 3050.00                             | -0.00                              | 4.63                                | 3.79                    | 0.53                    | -0.00                    | 405.65                   | -0.00                   | 0.62                     |
| 49                               | 28.88                              | 3.39                               | -0.00                               | 3040.00                             | -0.00                              | 4.44                                | 4.42                    | 0.52                    | -0.00                    | 465.12                   | -0.00                   | 0.68                     |
| 73                               | 24.37                              | 2.61                               | -0.00                               | 3040.00                             | -0.00                              | 4.80                                | 4.24                    | 0.46                    | -0.00                    | 528.96                   | -0.00                   | 0.84                     |
| 98                               | 22.98                              | 1.68                               | -0.00                               | 3040.00                             | -0.00                              | 5.06                                | 4.71                    | 0.35                    | -0.00                    | 623.20                   | -0.00                   | 1.04                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 25                                           | 93.169            | 9966.820               | 12.999             | -0.000            | -0.000                 | 15.117                 |
| 49                                           | 55.856            | 5880.148               | 6.567              | -0.000            | -0.000                 | 8.592                  |
| 73                                           | 35.846            | 4471.340               | 3.846              | -0.000            | -0.000                 | 7.066                  |
| 98                                           | 29.841            | 3946.800               | 2.186              | -0.000            | -0.000                 | 6.567                  |

DATE: 6/15/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 92 ENGINE TYPE AND MODEL: GTCP85-180 SERIAL NUMBER: P-595  
RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 111.00 FINISH 111.00

ATMOSPHERIC PRESSURE: START 28.64 FINISH 28.64

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TFST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGRFFS F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |             |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 22/ 0        | 157.20      | 85.38       |           | 40700.00               | -0.00 | 266.50                             | -0.00                         | 0.017600                         | 112.00                                   | 49.60                                       | 63.40                   |
| 19/22        | 117.20      | 116.26      |           | 40700.00               | -0.00 | 261.50                             | -0.00                         | 0.016300                         | 112.00                                   | 49.70                                       | 46.16                   |
| 15/19        | 78.30       | 137.73      |           | 40800.00               | -0.00 | 264.50                             | -0.00                         | 0.016000                         | 110.00                                   | 48.50                                       | 104.91                  |
| 10/15        | 40.10       | 149.20      |           | 40800.00               | -0.00 | 251.50                             | -0.00                         | 0.016100                         | 110.00                                   | 47.20                                       | 116.77                  |
| 5/10         | 0.0         | 164.95      |           | 40800.00               | -0.00 | 241.50                             | -0.00                         | 0.016400                         | 110.00                                   | 45.70                                       | 133.42                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 98                               | 1150.00                             | -0.00                              | 197.30              | 3.55                          | 6.30                 | 51.60               | 8.80                     | 60.40                    | -0.00     | -0.00 | -0.00        |
| 73                               | 1150.00                             | -0.00                              | 265.70              | 3.30                          | 5.70                 | 43.10               | 11.10                    | 54.20                    | -0.00     | -0.00 | -0.00        |
| 48                               | 1150.00                             | -0.00                              | 289.60              | 3.23                          | 7.90                 | 37.90               | 15.00                    | 52.40                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1150.00                             | -0.00                              | 324.30              | 3.25                          | 13.00                | 35.40               | 14.70                    | 50.10                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1150.00                             | -0.00                              | 331.50              | 3.32                          | 14.80                | 35.60               | 14.60                    | 50.20                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 98                               | 10.68                              | 0.19                               | -0.00                               | 3020.00                             | -0.00                              | 5.37                                | 2.85                    | 0.05                    | -0.00                    | 904.83                   | -0.00                   | 1.43                     |
| 73                               | 15.49                              | 0.19                               | -0.00                               | 3020.00                             | -0.00                              | 5.19                                | 4.05                    | 0.05                    | -0.00                    | 789.73                   | -0.00                   | 1.36                     |
| 48                               | 17.24                              | 0.27                               | -0.00                               | 3020.00                             | -0.00                              | 5.17                                | 4.56                    | 0.07                    | -0.00                    | 798.79                   | -0.00                   | 1.37                     |
| 25                               | 19.20                              | 0.44                               | -0.00                               | 3020.00                             | -0.00                              | 4.87                                | 4.83                    | 0.11                    | -0.00                    | 759.53                   | -0.00                   | 1.22                     |
| 0                                | 19.20                              | 0.49                               | -0.00                               | 3020.00                             | -0.00                              | 4.78                                | 4.64                    | 0.12                    | -0.00                    | 729.33                   | -0.00                   | 1.15                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 98                               | 11.736            | 3317.750               | 0.213              | -0.000            | -0.000                 | 5.907                  |
| 73                               | 17.353            | 3387.688               | 0.212              | -0.000            | -0.000                 | 5.816                  |
| 48                               | 21.108            | 3697.595               | 0.328              | -0.000            | -0.000                 | 6.125                  |
| 25                               | 25.507            | 4012.324               | 0.586              | -0.000            | -0.000                 | 6.466                  |
| 0                                | 28.113            | 4421.480               | 0.717              | -0.000            | -0.000                 | 6.995                  |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 46 ENGINE TYPE AND MODEL: GTCP85-180 SERIAL NUMBER: P-593

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 97.00 FINISH 97.00

ATMOSPHERIC PRESSURE: START 28.62 FINISH 28.62

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0042

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHF LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |                    | N1                     | N2                                 |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0                | 41600.00               | -0.00                              | 118.00                        | -0.00                            | 0.006700                                 | 94.00                                       | 0.0                     |
| 6/ 1         | 39.70       | 0.0                | 41400.00               | -0.00                              | 139.00                        | -0.00                            | 0.008100                                 | 95.00                                       | 0.0                     |
| 11/ 6        | 79.10       | 0.0                | 41200.00               | -0.00                              | 156.00                        | -0.00                            | 0.009200                                 | 98.00                                       | 0.0                     |
| 16/11        | 118.60      | 0.0                | 41200.00               | -0.00                              | 180.00                        | -0.00                            | 0.010400                                 | 98.00                                       | 0.0                     |
| 20/16        | 158.30      | 0.0                | 41000.00               | -0.00                              | 208.00                        | -0.00                            | 0.012000                                 | 98.00                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHF | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 500.00                              | -0.00                              | 143.50              | 1.36                          | 25.00                | 10.10               | 7.40                     | 17.50                    | -0.00     | -0.00 | -0.00        |
| 24                               | 585.00                              | -0.00                              | 164.80              | 1.64                          | 26.40                | 14.70               | 9.80                     | 24.50                    | -0.00     | -0.00 | -0.00        |
| 49                               | 655.00                              | -0.00                              | 185.70              | 1.87                          | 24.50                | 17.70               | 11.00                    | 28.70                    | -0.00     | -0.00 | -0.00        |
| 74                               | 740.00                              | -0.00                              | 206.70              | 2.12                          | 22.40                | 21.30               | 12.20                    | 33.60                    | -0.00     | -0.00 | -0.00        |
| 98                               | 830.00                              | -0.00                              | 236.90              | 2.45                          | 19.00                | 25.80               | 13.00                    | 38.80                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHF | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 20.58                              | 2.05                               | -0.00                               | 3070.00                             | -0.00                              | 4.12                                | 2.43                    | 0.24                    | -0.00                    | 362.26                   | -0.00                   | 0.49                     |
| 24                               | 19.60                              | 1.79                               | -0.00                               | 3070.00                             | -0.00                              | 4.80                                | 2.72                    | 0.25                    | -0.00                    | 426.73                   | -0.00                   | 0.67                     |
| 49                               | 19.39                              | 1.46                               | -0.00                               | 3060.00                             | -0.00                              | 4.92                                | 3.02                    | 0.23                    | -0.00                    | 477.36                   | -0.00                   | 0.77                     |
| 74                               | 18.96                              | 1.18                               | -0.00                               | 3050.00                             | -0.00                              | 5.06                                | 3.41                    | 0.21                    | -0.00                    | 549.07                   | -0.00                   | 0.91                     |
| 98                               | 18.75                              | 0.86                               | -0.00                               | 3050.00                             | -0.00                              | 5.04                                | 3.90                    | 0.18                    | -0.00                    | 634.40                   | -0.00                   | 1.05                     |

| POWER<br>PERCENT<br>RATED<br>SHF | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |       |        |        |        |
|----|--------|-----------|-------|--------|--------|--------|
| 24 | 68.635 | 10748.859 | 6.281 | -0.000 | -0.000 | 16.799 |
| 49 | 38.243 | 6034.891  | 2.887 | -0.000 | -0.000 | 9.713  |
| 74 | 28.783 | 4629.000  | 1.786 | -0.000 | -0.000 | 7.677  |
| 98 | 24.641 | 4007.579  | 1.131 | -0.000 | -0.000 | 6.625  |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 65 ENGINE TYPE AND MODEL: GTCPS-180

SERIAL NUMBER: P-593

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KERO

FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 104.00 FINISH 104.00

ATMOSPHERIC PRESSURE: START 28.62 FINISH 28.62

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0042

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST MODE | POWER<br>SHAFT HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|-----------|-------------------|-----------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0     | 157.50            | 89.64     | 40800.00               | -0.00 | -0.00 | 276.50                             | -0.00                         | 0.016500                         | 100.00                                   | 52.50                                       | 64.40                   |
| 19/22     | 117.70            | 118.21    | 40900.00               | -0.00 | -0.00 | 268.50                             | -0.00                         | 0.016300                         | 101.00                                   | 51.60                                       | 86.16                   |
| 15/19     | 78.50             | 134.60    | 40900.00               | -0.00 | -0.00 | 256.50                             | -0.00                         | 0.016200                         | 108.00                                   | 49.90                                       | 100.06                  |
| 10/15     | 39.30             | 151.98    | 41000.00               | -0.00 | -0.00 | 248.50                             | -0.00                         | 0.016000                         | 106.00                                   | 48.90                                       | 115.64                  |
| 5/10      | 0.0               | 167.56    | 4100.00                | -0.00 | -0.00 | 241.50                             | -0.00                         | 0.016500                         | 105.00                                   | 47.10                                       | 132.58                  |
| 3/ 5      | 0.0               | 132.95    | 41300.00               | -0.00 | -0.00 | 206.50                             | -0.00                         | 0.012700                         | 104.00                                   | 49.80                                       | 99.73                   |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 98                               | 1150.00                             | -0.00                              | 200.60              | 1.35                          | 4.20                 | 44.90               | 10.10                    | 55.00                    | -0.00     | -0.00 | -0.00        |
| 73                               | 1150.00                             | -0.00                              | 214.30              | 3.30                          | 3.30                 | 44.50               | 9.70                     | 54.20                    | -0.00     | -0.00 | -0.00        |
| 49                               | 1150.00                             | -0.00                              | 247.70              | 3.27                          | 4.80                 | 39.80               | 12.10                    | 51.90                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1150.00                             | -0.00                              | 258.70              | 3.23                          | 6.40                 | 39.00               | 11.80                    | 50.90                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1150.00                             | -0.00                              | 265.70              | 3.35                          | 8.10                 | 38.90               | 11.90                    | 50.80                    | -0.00     | -0.00 | -0.00        |
| 0                                | 950.00                              | -0.00                              | 300.00              | 2.56                          | 25.80                | 24.20               | 14.00                    | 38.20                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 98                               | 11.55                              | 0.14                               | -0.00                               | 3030.00                             | -0.00                              | 5.20                                | 3.19                    | 0.04                    | -0.00                    | 817.79                   | -0.00                   | 1.44                     |
| 73                               | 12.50                              | 0.11                               | -0.00                               | 3030.00                             | -0.00                              | 5.19                                | 1.36                    | 0.03                    | -0.00                    | 813.55                   | -0.00                   | 1.39                     |
| 49                               | 14.59                              | 0.16                               | -0.00                               | 3030.00                             | -0.00                              | 5.02                                | 3.74                    | 0.04                    | -0.00                    | 777.19                   | -0.00                   | 1.29                     |
| 24                               | 15.44                              | 0.22                               | -0.00                               | 3030.00                             | -0.00                              | 4.98                                | 3.84                    | 0.05                    | -0.00                    | 752.95                   | -0.00                   | 1.24                     |
| 0                                | 15.28                              | 0.26                               | -0.00                               | 3020.00                             | -0.00                              | 4.80                                | 3.69                    | 0.06                    | -0.00                    | 724.33                   | -0.00                   | 1.16                     |
| 0                                | 22.62                              | 1.11                               | -0.00                               | 3030.00                             | -0.00                              | 4.73                                | 4.67                    | 0.23                    | -0.00                    | 625.69                   | -0.00                   | 0.98                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 98                               | 12.922            | 3389.917               | 0.153              | -0.000            | -0.000                 | 5.920                  |
| 73                               | 14.229            | 3448.653               | 0.126              | -0.000            | -0.000                 | 5.907                  |
| 49                               | 17.558            | 3647.128               | 0.196              | -0.000            | -0.000                 | 6.044                  |
| 24                               | 20.054            | 3936.486               | 0.283              | -0.000            | -0.000                 | 6.476                  |
| 0                                | 22.020            | 4352.762               | 0.382              | -0.000            | -0.000                 | 6.913                  |
| 0                                | 35.135            | 4706.230               | 1.724              | -0.000            | -0.000                 | 7.347                  |

DATE: 6/ 7/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 47 ENGINE TYPE AND MODEL: GTCR85-98CK SERIAL NUMBER: P-35648

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROSE FUEL H/C RATIO: 1.928

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 96.00 FINISH 96.00

ATMOSPHERIC PRESSURE: START 28.65 FINISH 28.65

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0019

RELATIVE HUMIDITY: 6.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SMP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0                | 41500.00               | -0.00                  | 122.00                             | -0.00                         | 0.007200                         | 90.00                                    | 53.90                                       | 0.0                     |
| 6/ 1         | 39.70       | 0.0                | 41400.00               | -0.00                  | 141.60                             | -0.00                         | 0.008400                         | 93.00                                    | 53.40                                       | 0.0                     |
| 11/ 6        | 78.30       | 0.0                | 41300.00               | -0.00                  | 161.80                             | -0.00                         | 0.009600                         | 95.00                                    | 52.90                                       | 0.0                     |
| 16/11        | 117.30      | 0.0                | 41100.00               | -0.00                  | 184.00                             | -0.00                         | 0.010900                         | 98.00                                    | 52.40                                       | 0.0                     |
| 20/16        | 155.40      | 0.0                | 41000.00               | -0.00                  | 214.00                             | -0.00                         | 0.013100                         | 104.00                                   | 51.90                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SMP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 560.00                              | -0.00                              | 160.70              | 1.45                          | 61.10                | 1.20                | 6.50                     | 7.70                     | -0.00     | -0.00 | -0.00        |
| 24                               | 630.00                              | -0.00                              | 164.90              | 1.71                          | 41.50                | 9.50                | 7.70                     | 17.20                    | -0.00     | -0.00 | -0.00        |
| 48                               | 700.00                              | -0.00                              | 168.70              | 1.96                          | 29.20                | 12.80               | 7.80                     | 20.60                    | -0.00     | -0.00 | -0.00        |
| 73                               | 805.00                              | -0.00                              | 179.80              | 2.22                          | 22.00                | 17.40               | 8.00                     | 25.40                    | -0.00     | -0.00 | -0.00        |
| 97                               | 930.00                              | -0.00                              | 212.90              | 2.66                          | 19.60                | 22.40               | 8.20                     | 30.60                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SMP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 21.55                              | 4.68                               | -0.00                               | 3060.00                             | -0.00                              | 1.69                                | 2.63                    | 0.57                    | -0.00                    | 373.32                   | -0.00                   | 0.21                     |
| 24                               | 18.83                              | 2.71                               | -0.00                               | 3060.00                             | -0.00                              | 3.22                                | 2.67                    | 0.38                    | -0.00                    | 433.30                   | -0.00                   | 0.46                     |
| 48                               | 16.81                              | 1.66                               | -0.00                               | 3060.00                             | -0.00                              | 3.36                                | 2.72                    | 0.27                    | -0.00                    | 495.11                   | -0.00                   | 0.54                     |
| 73                               | 15.78                              | 1.10                               | -0.00                               | 3060.00                             | -0.00                              | 3.66                                | 2.90                    | 0.20                    | -0.00                    | 563.04                   | -0.00                   | 0.67                     |
| 97                               | 15.53                              | 0.82                               | -0.00                               | 3040.00                             | -0.00                              | 3.67                                | 3.32                    | 0.17                    | -0.00                    | 650.56                   | -0.00                   | 0.78                     |

| POWER<br>PERCENT<br>RATED<br>SMP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HRSFPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |       |        |        |        |
|----|--------|-----------|-------|--------|--------|--------|
| 24 | 67.180 | 10914.246 | 9.669 | -0.000 | -0.000 | 11.478 |
| 48 | 34.728 | 6323.219  | 3.434 | -0.000 | -0.000 | 6.951  |
| 73 | 24.750 | 4799.996  | 1.729 | -0.000 | -0.000 | 5.738  |
| 97 | 21.392 | 4186.355  | 1.124 | -0.000 | -0.000 | 5.050  |

DATE: 6/ 7/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 66 ENGINE TYPE AND MODEL: GTCB5-98CK SERIAL NUMBER: P-35648

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MDT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 123.00 FINISH 123.00

ATMOSPHERIC PRESSURE: START 28.65 FINISH 28.65

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0019

RELATIVE HUMIDITY: 6.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE                     | SHAFT<br>HP                         | POWER                              |                                     | ENGINE<br>SPEED<br>RPM              |                                    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR  | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |                          |
|----------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|--------------------------|
|                                  |                                     | AIR<br>HP                          |                                     | N1                                  | N2                                 |                                     |                               |                                  |                                          |                                             |                         |                          |
|                                  |                                     |                                    |                                     |                                     |                                    |                                     |                               |                                  |                                          |                                             |                         |                          |
| 22/ 0                            | 154.30                              | 51.97                              | 40700.00                            | -0.00                               | 258.00                             | -0.00                               | 0.017800                      | 130.30                           | 48.20                                    | 38.46                                       |                         |                          |
| 19/22                            | 116.50                              | 73.63                              | 40800.00                            | -0.00                               | 244.00                             | -0.00                               | 0.017100                      | 125.00                           | 47.70                                    | 55.56                                       |                         |                          |
| 15/19                            | 77.30                               | 104.85                             | 40800.00                            | -0.00                               | 244.00                             | -0.00                               | 0.017300                      | 126.00                           | 46.50                                    | 81.04                                       |                         |                          |
| 10/15                            | 39.10                               | 128.35                             | 40800.00                            | -0.00                               | 242.00                             | -0.00                               | 0.017300                      | 120.00                           | 46.00                                    | 101.34                                      |                         |                          |
| 5/10                             | 0.0                                 | 144.48                             | 40800.00                            | -0.00                               | 234.00                             | -0.00                               | 0.016800                      | 114.00                           | 45.00                                    | 117.92                                      |                         |                          |
|                                  |                                     |                                    |                                     |                                     |                                    |                                     |                               |                                  |                                          |                                             |                         |                          |
| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV                 | CO<br>2<br>(WET)<br>PERCENT V       | THC<br>(WET)<br>PPMV               | NO<br>(WET)<br>PPMV                 | NO<br>2<br>(WET)<br>PPMV      | NO<br>X<br>(WET)<br>PPMV         | ALDEHYDES                                | SMOKE                                       | PARTICULATES            |                          |
|                                  |                                     |                                    |                                     |                                     |                                    |                                     |                               |                                  |                                          |                                             |                         |                          |
| 96                               | 1210.00                             | -0.00                              | 196.20                              | 3.59                                | 15.70                              | 35.30                               | 6.70                          | 42.00                            | -0.00                                    | -0.00                                       | -0.00                   |                          |
| 72                               | 1150.00                             | -0.00                              | 212.30                              | 3.46                                | 26.30                              | 31.60                               | 7.60                          | 39.20                            | -0.00                                    | -0.00                                       | -0.00                   |                          |
| 48                               | 1155.00                             | -0.00                              | 216.90                              | 3.49                                | 24.20                              | 30.20                               | 8.50                          | 38.80                            | -0.00                                    | -0.00                                       | -0.00                   |                          |
| 24                               | 1160.00                             | -0.00                              | 216.00                              | 3.50                                | 24.20                              | 30.50                               | 8.10                          | 38.60                            | -0.00                                    | -0.00                                       | -0.00                   |                          |
| 0                                | 1160.00                             | -0.00                              | 235.10                              | 3.40                                | 25.60                              | 29.30                               | 9.00                          | 38.30                            | -0.00                                    | -0.00                                       | -0.00                   |                          |
|                                  |                                     |                                    |                                     |                                     |                                    |                                     |                               |                                  |                                          |                                             |                         |                          |
| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL  | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR       | MASS EMI<br>HC<br>LB/HR          | MASS EMI<br>NO2<br>LB/HR                 | MASS EMI<br>CO2<br>LB/HR                    | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|                                  |                                     |                                    |                                     |                                     |                                    |                                     |                               |                                  |                                          |                                             |                         |                          |
| 96                               | 10.50                               | 0.48                               | -0.00                               | 3020.00                             | -0.00                              | 3.69                                | 2.71                          | 0.12                             | -0.00                                    | 779.16                                      | -0.00                   | 0.95                     |
| 72                               | 11.80                               | 0.84                               | -0.00                               | 3020.00                             | -0.00                              | 3.58                                | 2.88                          | 0.20                             | -0.00                                    | 736.88                                      | -0.00                   | 0.87                     |
| 48                               | 11.95                               | 0.76                               | -0.00                               | 3020.00                             | -0.00                              | 3.51                                | 2.92                          | 0.19                             | -0.00                                    | 736.88                                      | -0.00                   | 0.86                     |
| 24                               | 11.87                               | 0.76                               | -0.00                               | 3020.00                             | -0.00                              | 3.49                                | 2.87                          | 0.18                             | -0.00                                    | 730.84                                      | -0.00                   | 0.84                     |
| 0                                | 13.32                               | 0.83                               | -0.00                               | 3020.00                             | -0.00                              | 3.57                                | 3.12                          | 0.19                             | -0.00                                    | 706.69                                      | -0.00                   | 0.83                     |
|                                  |                                     |                                    |                                     |                                     |                                    |                                     |                               |                                  |                                          |                                             |                         |                          |
| POWER<br>PERCENT<br>RATED<br>SHP | CO                                  |                                    | CO<br>2                             |                                     | THC                                |                                     | NO                            |                                  | NO<br>2                                  |                                             | NO<br>X                 |                          |
|                                  | LB/1K                               | MP-HR                              | LB/1K                               | MP-HR                               | LB/1K                              | MP-HR                               | LB/1K                         | MP-HR                            | LB/1K                                    | MP-HR                                       | LB/1K                   | MP-HR                    |
| 96                               | 17.136                              |                                    | 3777.388                            |                                     | 0.599                              |                                     | -0.000                        |                                  | -0.000                                   |                                             | 4.617                   |                          |
| 72                               | 15.147                              |                                    | 3875.601                            |                                     | 1.073                              |                                     | -0.000                        |                                  | -0.000                                   |                                             | 4.592                   |                          |
| 48                               | 16.006                              |                                    | 4045.375                            |                                     | 1.022                              |                                     | -0.000                        |                                  | -0.000                                   |                                             | 4.700                   |                          |
| 24                               | 17.155                              |                                    | 4364.539                            |                                     | 1.100                              |                                     | -0.000                        |                                  | -0.000                                   |                                             | 5.019                   |                          |
| 0                                | 21.572                              |                                    | 4891.250                            |                                     | 1.341                              |                                     | -0.000                        |                                  | -0.000                                   |                                             | 5.777                   |                          |

DATE: 5/ 3/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 48 ENGINE TYPE AND MODEL: GTC85-980 SERIAL NUMBER: P-27692

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 28.72 FINISH 28.72

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0026

RELATIVE HUMIDITY: 10.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHF LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |             |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0         | 0.0       | 41200.00               | -0.00 | 125.50                             | -0.00                         | 0.007300                         | 92.00                                    | 51.90                                       | 0.0                     |
| 6/ 1         | 40.40       | 0.0         | 0.0       | 41100.00               | -0.00 | 152.00                             | -0.00                         | 0.008500                         | 74.00                                    | 51.40                                       | 0.0                     |
| 11/ 6        | 80.60       | 0.0         | 0.0       | 41000.00               | -0.00 | 172.40                             | -0.00                         | 0.010100                         | 74.00                                    | 51.70                                       | 0.0                     |
| 16/11        | 120.90      | 0.0         | 0.0       | 41000.00               | -0.00 | 197.80                             | -0.00                         | 0.011900                         | 74.00                                    | 51.70                                       | 0.0                     |
| 20/16        | 141.70      | 0.0         | 0.0       | 40900.00               | -0.00 | 232.00                             | -0.00                         | 0.014100                         | 75.00                                    | 51.60                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 25                               | 680.00                              | -0.00                              | 229.40              | 1.73                          | 49.60                | 10.10               | 13.80                    | 23.90                    | -0.00     | -0.00 | -0.00        |
| 50                               | 750.00                              | -0.00                              | 262.30              | 2.06                          | 43.50                | 14.40               | 14.80                    | 29.20                    | -0.00     | -0.00 | -0.00        |
| 75                               | 865.00                              | -0.00                              | 275.00              | 2.41                          | 33.70                | 21.90               | 14.00                    | 35.90                    | -0.00     | -0.00 | -0.00        |
| 88                               | 985.00                              | -0.00                              | 260.80              | 2.86                          | 16.30                | 32.40               | 12.80                    | 45.20                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 25                               | 25.82                              | 3.19                               | -0.00                               | 3060.00                             | -0.00                              | 4.42                                | 3.92                    | 0.48                    | -0.00                    | 465.12                   | -0.00                   | 0.67                     |
| 50                               | 24.80                              | 2.35                               | -0.00                               | 3060.00                             | -0.00                              | 4.54                                | 4.28                    | 0.41                    | -0.00                    | 527.54                   | -0.00                   | 0.78                     |
| 75                               | 22.16                              | 1.55                               | -0.00                               | 3050.00                             | -0.00                              | 4.76                                | 4.38                    | 0.31                    | -0.00                    | 603.29                   | -0.00                   | 0.94                     |
| 88                               | 17.71                              | 0.63                               | -0.00                               | 3050.00                             | -0.00                              | 5.04                                | 4.11                    | 0.15                    | -0.00                    | 707.60                   | -0.00                   | 1.17                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |        |        |        |        |
|----|--------|-----------|--------|--------|--------|--------|
| 25 | 97.144 | 11512.863 | 11.998 | -0.000 | -0.000 | 16.626 |
| 50 | 51.053 | 6545.207  | 5.033  | -0.000 | -0.000 | 9.709  |
| 75 | 36.258 | 4989.988  | 2.542  | -0.000 | -0.000 | 7.783  |
| 88 | 28.993 | 4993.645  | 1.033  | -0.000 | -0.000 | 8.252  |

DATE: 5/ 3/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 67 ENGINE TYPE AND MODEL: GTCPS-980 SERIAL NUMBER: P-27692  
RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 98.00 FINISH 98.00

ATMOSPHERIC PRESSURE: START 28.72 FINISH 28.72

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0026

RELATIVE HUMIDITY: 10.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 81.00       | 49.01              | 40700.00               | -0.00 | -0.00 | 277.50                             | -0.00                         | 0.018600                         | 96.00                                    | 52.10                                       | 35.72                   |
| 19/22        | 60.00       | 73.55              | 40700.00               | -0.00 | -0.00 | 258.00                             | -0.00                         | 0.018000                         | 96.00                                    | 50.70                                       | 55.01                   |
| 15/19        | 40.10       | 98.04              | 40800.00               | -0.00 | -0.00 | 267.00                             | -0.00                         | 0.018300                         | 98.00                                    | 49.10                                       | 75.37                   |
| 10/15        | 40.00       | -0.00              | 40700.00               | -0.00 | -0.00 | 206.00                             | -0.00                         | 0.018600                         | 100.00                                   | 45.10                                       | -0.00                   |
| 5/10         | 0.0         | -0.00              | 40800.00               | -0.00 | -0.00 | 201.00                             | -0.00                         | 0.017300                         | 100.00                                   | 43.80                                       | -0.00                   |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 50                               | 1250.00                             | -0.00                              | 130.70              | 3.78                          | 1.30                 | 60.90               | 8.60                     | 69.50                    | -0.00     | -0.00 | -0.00        |
| 37                               | 1250.00                             | -0.00                              | 142.50              | 3.67                          | 2.10                 | 58.90               | 9.00                     | 67.90                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1250.00                             | -0.00                              | 146.00              | 3.74                          | 1.70                 | 56.50               | 9.70                     | 66.20                    | -0.00     | -0.00 | -0.00        |
| 25                               | 1235.00                             | -0.00                              | 171.40              | 3.79                          | 0.30                 | 55.20               | 9.10                     | 64.30                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1200.00                             | -0.00                              | 214.60              | 3.51                          | 4.70                 | 48.30               | 11.50                    | 59.80                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>H2O<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 50                               | 6.68                               | 0.04                               | -0.00                               | 3040.00                             | -0.00                              | 5.83                                | 1.85                    | 0.01                    | -0.00                    | 843.60                   | -0.00                    | 1.62                     |
| 37                               | 7.52                               | 0.06                               | -0.00                               | 3040.00                             | -0.00                              | 5.88                                | 1.94                    | 0.02                    | -0.00                    | 784.32                   | -0.00                    | 1.52                     |
| 25                               | 7.56                               | 0.05                               | -0.00                               | 3040.00                             | -0.00                              | 5.63                                | 2.02                    | 0.01                    | -0.00                    | 811.68                   | -0.00                    | 1.50                     |
| 25                               | 8.74                               | 0.01                               | -0.00                               | 3030.00                             | -0.00                              | 5.39                                | 1.80                    | 0.00                    | -0.00                    | 624.18                   | -0.00                    | 1.11                     |
| 0                                | 11.81                              | 0.15                               | -0.00                               | 3040.00                             | -0.00                              | 5.41                                | 2.47                    | 0.03                    | -0.00                    | 611.04                   | -0.00                    | 1.09                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 50                               | 14.251            | 6488.590               | 0.079              | -0.000            | -0.000                 | 12.448                 |
| 37                               | 14.523            | 5872.707               | 0.124              | -0.000            | -0.000                 | 11.365                 |
| 25                               | 14.608            | 5875.594               | 0.099              | -0.000            | -0.000                 | 10.874                 |

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*  
\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

DATE: 5/ 6/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 49 ENGINE TYPE AND MODEL: GTCPS-980 SERIAL NUMBER: P-27857

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 28.78 FINISH 28.78

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0061

RELATIVE HUMIDITY: 40.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |     |
|--------------|-------------|--------------------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|-----|
| 1/ 0         | 0.0         | 0.0                | 41100.00               | -0.00                              | 112.50                        | -0.00                            | 0.009600                                 | 79.00                                       | 57.90                   | 0.0 |
| 6/ 1         | 39.30       | 0.0                | 40950.00               | -0.00                              | 137.00                        | -0.00                            | 0.007900                                 | 78.00                                       | 56.60                   | 0.0 |
| 11/ 6        | 77.90       | 0.0                | 40850.00               | -0.00                              | 159.50                        | -0.00                            | 0.009400                                 | 77.00                                       | 56.90                   | 0.0 |
| 16/11        | 116.70      | 0.0                | 40700.00               | -0.00                              | 184.50                        | -0.00                            | 0.010200                                 | 77.00                                       | 56.50                   | 0.0 |
| 20/16        | 155.80      | 0.0                | 40600.00               | -0.00                              | 211.00                        | -0.00                            | 0.012700                                 | 76.00                                       | 56.40                   | 0.0 |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 540.00                              | -0.00                              | 182.20              | 1.96                          | 63.60                | 3.60                | 11.80                    | 15.50                    | -0.00     | -0.00 | -0.00        |
| 24                               | 605.00                              | -0.00                              | 246.90              | 1.61                          | 84.80                | 7.00                | 13.50                    | 20.50                    | -0.00     | -0.00 | -0.00        |
| 48                               | 670.00                              | -0.00                              | 289.70              | 1.90                          | 79.40                | 10.10               | 14.50                    | 24.60                    | -0.00     | -0.00 | -0.00        |
| 72                               | 765.00                              | -0.00                              | 355.20              | 2.05                          | 71.40                | 13.30               | 17.00                    | 30.30                    | -0.00     | -0.00 | -0.00        |
| 97                               | 870.00                              | -0.00                              | 334.30              | 2.57                          | 41.40                | 20.90               | 16.50                    | 37.40                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 18.19                              | 3.63                               | -0.00                               | 3070.00                             | -0.00                              | 2.53                                | 2.05                    | 0.41                    | -0.00                    | 345.37                   | -0.00                   | 0.29                     |
| 24                               | 29.86                              | 5.86                               | -0.00                               | 3050.00                             | -0.00                              | 4.07                                | 4.09                    | 0.80                    | -0.00                    | 417.85                   | -0.00                   | 0.56                     |
| 48                               | 29.66                              | 4.63                               | -0.00                               | 3050.00                             | -0.00                              | 4.12                                | 4.73                    | 0.74                    | -0.00                    | 486.47                   | -0.00                   | 0.66                     |
| 72                               | 33.48                              | 3.84                               | -0.00                               | 3040.00                             | -0.00                              | 4.69                                | 6.19                    | 0.71                    | -0.00                    | 560.88                   | -0.00                   | 0.87                     |
| 97                               | 25.14                              | 1.76                               | -0.00                               | 3040.00                             | -0.00                              | 4.62                                | 5.30                    | 0.37                    | -0.00                    | 641.44                   | -0.00                   | 0.97                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO<br>LB/LK HP-HR | CO<br>2<br>LB/LK HP-HR | THC<br>LB/LK HP-HR | NO<br>LB/LK HP-HR | NO<br>2<br>LB/LK HP-HR | NO<br>X<br>LB/LK HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 24                                           | 104.082           | 10632.309              | 20.445             | -0.000            | -0.000                 | 14.198                 |
| 48                                           | 60.723            | 6244.863               | 9.484              | -0.000            | -0.000                 | 8.444                  |
| 72                                           | 52.928            | 4806.168               | 6.077              | -0.000            | -0.000                 | 7.416                  |
| 97                                           | 34.046            | 4117.070               | 2.390              | -0.000            | -0.000                 | 6.253                  |

DATE: 5/ 6/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 68 ENGINE TYPE AND MODEL: GTCP85-98D SERIAL NUMBER: P-27857  
RATED SHAFT HORSEPOWER: 160.  
ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 76.00  
ATMOSPHERIC PRESSURE: START 28.78 FINISH 28.78  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0061  
RELATIVE HUMIDITY: 40.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1     | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LR/MIN |
|--------------|-------------|-------------|-----------|------------------------|--------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 153.90      | 88.03       | 40100.00  | -0.00                  | 284.50 | -0.00 | 0.019700                           | 78.00                         | 53.40                            | 64.79                                    |                                             |                         |
| 19/22        | 115.50      | 106.58      | 40300.00  | -0.00                  | 273.00 | -0.00 | 0.018400                           | 75.00                         | 52.70                            | 79.86                                    |                                             |                         |
| 15/19        | 76.90       | 125.06      | 40300.00  | -0.00                  | 264.00 | -0.00 | 0.018100                           | 74.00                         | 51.70                            | 95.59                                    |                                             |                         |
| 10/15        | 38.80       | 139.40      | 40400.00  | -0.00                  | 255.00 | -0.00 | 0.017500                           | 73.00                         | 50.50                            | 109.17                                   |                                             |                         |
| 5/10         | 0.0         | 150.48      | 40500.00  | -0.00                  | 234.00 | -0.00 | 0.017700                           | 81.00                         | 49.00                            | 119.55                                   |                                             |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 96                               | 1230.00                             | -0.00                              | 138.10              | 4.00                          | 41.40                | 60.30               | 9.00                     | 69.30                    | -0.00     | -0.00 | -0.00        |
| 72                               | 1195.00                             | -0.00                              | 201.00              | 3.73                          | 40.60                | 56.70               | 9.60                     | 66.30                    | -0.00     | -0.00 | -0.00        |
| 48                               | 1185.00                             | -0.00                              | 212.30              | 3.68                          | 73.30                | 50.60               | 11.90                    | 62.50                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1175.00                             | -0.00                              | 240.50              | 3.56                          | 76.20                | 47.50               | 11.70                    | 59.20                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1170.00                             | -0.00                              | 202.80              | 3.59                          | 13.80                | 42.80               | 12.80                    | 55.60                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 96                               | 6.64                               | 1.14                               | -0.00                               | 3030.00                             | -0.00                              | 5.49                                | 1.89                    | 0.12                    | -0.00                    | 862.03                   | -0.00                   | 1.56                     |
| 72                               | 10.40                              | 1.20                               | -0.00                               | 3030.00                             | -0.00                              | 5.64                                | 2.84                    | 0.33                    | -0.00                    | 827.19                   | -0.00                   | 1.54                     |
| 48                               | 11.13                              | 2.20                               | -0.00                               | 3030.00                             | -0.00                              | 5.38                                | 2.94                    | 0.58                    | -0.00                    | 799.92                   | -0.00                   | 1.42                     |
| 24                               | 13.04                              | 2.36                               | -0.00                               | 3030.00                             | -0.00                              | 5.27                                | 3.33                    | 0.60                    | -0.00                    | 772.65                   | -0.00                   | 1.34                     |
| 0                                | 10.90                              | 0.42                               | -0.00                               | 3040.00                             | -0.00                              | 4.91                                | 2.55                    | 0.10                    | -0.00                    | 711.36                   | -0.00                   | 1.15                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 96                               | 7.814             | 3563.224               | 1.338              | -0.000            | -0.000                 | 6.442                  |
| 72                               | 12.788            | 3724.758               | 1.476              | -0.000            | -0.000                 | 6.933                  |
| 48                               | 14.546            | 3960.786               | 2.872              | -0.000            | -0.000                 | 7.038                  |
| 24                               | 18.663            | 4335.809               | 3.378              | -0.000            | -0.000                 | 7.518                  |
| 0                                | 16.956            | 4727.387               | 0.659              | -0.000            | -0.000                 | 7.631                  |

DATE: 5/ 1/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 50 ENGINE TYPE AND MODEL: GTCB85-98 SERIAL NUMBER: P-15454

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MGT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 28.65 FINISH 28.65

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0019

RELATIVE HUMIDITY: 18.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER | AIR<br>HP | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |     |
|--------------|-------------|-------|-----------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|-----|
|              |             |       |           | N1                     | N2                                 |                               |                                  |                                          |                                             |                         |     |
| 1/ 0         | 0.0         | 0.0   | 0.0       | 41000.00               | -0.00                              | 113.00                        | -0.00                            | 0.006700                                 | 85.00                                       | 54.20                   | 0.0 |
| 6/ 1         | 38.30       | 0.0   | 0.0       | 40900.00               | -0.00                              | 132.00                        | -0.00                            | 0.008100                                 | 85.00                                       | 53.90                   | 0.0 |
| 11/ 6        | 76.40       | 0.0   | 0.0       | 40800.00               | -0.00                              | 154.00                        | -0.00                            | 0.009600                                 | 88.00                                       | 53.60                   | 0.0 |
| 16/11        | 114.30      | 0.0   | 0.0       | 40700.00               | -0.00                              | 177.00                        | -0.00                            | 0.011300                                 | 90.00                                       | 53.10                   | 0.0 |
| 20/16        | 151.60      | 0.0   | 0.0       | 40500.00               | -0.00                              | 208.80                        | -0.00                            | 0.013800                                 | 94.00                                       | 52.50                   | 0.0 |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 550.00                              | -0.00                              | 279.20              | 1.36                          | 112.10               | 2.50                | 9.40                     | 11.90                    | -0.00     | -0.00 | -0.00        |
| 23                               | 600.00                              | -0.00                              | 291.90              | 1.63                          | 81.00                | 4.90                | 10.40                    | 15.20                    | -0.00     | -0.00 | -0.00        |
| 47                               | 690.00                              | -0.00                              | 298.00              | 1.95                          | 51.20                | 8.50                | 11.10                    | 19.60                    | -0.00     | -0.00 | -0.00        |
| 71                               | 800.00                              | -0.00                              | 282.50              | 2.29                          | 30.10                | 13.60               | 10.60                    | 24.30                    | -0.00     | -0.00 | -0.00        |
| 94                               | 950.00                              | -0.00                              | 243.50              | 2.81                          | 10.80                | 22.50               | 9.00                     | 31.60                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 39.82                              | 9.14                               | -0.00                               | 3040.00                             | -0.00                              | 2.80                                | 4.50                    | 1.03                    | -0.00                    | 343.52                   | -0.00                   | 0.32                     |
| 23                               | 34.68                              | 5.50                               | -0.00                               | 3050.00                             | -0.00                              | 2.98                                | 4.58                    | 0.73                    | -0.00                    | 402.60                   | -0.00                   | 0.39                     |
| 47                               | 29.71                              | 2.92                               | -0.00                               | 3050.00                             | -0.00                              | 3.20                                | 4.58                    | 0.45                    | -0.00                    | 469.70                   | -0.00                   | 0.49                     |
| 71                               | 23.99                              | 1.46                               | -0.00                               | 3050.00                             | -0.00                              | 3.39                                | 4.25                    | 0.26                    | -0.00                    | 539.85                   | -0.00                   | 0.60                     |
| 94                               | 16.82                              | 0.43                               | -0.00                               | 3050.00                             | -0.00                              | 3.58                                | 3.51                    | 0.09                    | -0.00                    | 636.84                   | -0.00                   | 0.75                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |         |           |        |        |        |        |
|----|---------|-----------|--------|--------|--------|--------|
| 23 | 119.527 | 10911.742 | 18.949 | -0.000 | -0.000 | 10.257 |
| 47 | 59.891  | 6147.902  | 5.878  | -0.000 | -0.000 | 6.458  |
| 71 | 37.158  | 4723.094  | 2.262  | -0.000 | -0.000 | 5.245  |
| 94 | 23.172  | 4200.789  | 0.589  | -0.000 | -0.000 | 4.932  |

DATE: 5/1/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL TO NUMBER: 69 ENGINE TYPE AND MODEL: GTCPB5-98 SERIAL NUMBER: P-15454

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 95.00 FINISH 59.00

ATMOSPHERIC PRESSURE: START 28.65 FINISH 28.65

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0019

RELATIVE HUMIDITY: 18.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FRDM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 150.50      | 67.56              | 40200.00               | -0.00 | -0.00 | 261.50                             | -0.00                         | 0.018300                         | 96.00                                    | 51.60                                       | 49.69                   |
| 19/22        | 113.20      | 95.10              | 40300.00               | -0.00 | -0.00 | 251.50                             | -0.00                         | 0.018200                         | 96.00                                    | 50.40                                       | 71.53                   |
| 15/19        | 75.50       | 116.97             | 40300.00               | -0.00 | -0.00 | 246.50                             | -0.00                         | 0.017900                         | 95.00                                    | 49.40                                       | 89.87                   |
| 10/15        | 37.80       | 133.85             | 40400.00               | -0.00 | -0.00 | 241.50                             | -0.00                         | 0.017900                         | 94.00                                    | 47.70                                       | 106.65                  |
| 5/10         | 0.0         | 148.43             | 40400.00               | -0.00 | -0.00 | 231.70                             | -0.00                         | 0.017600                         | 92.00                                    | 46.40                                       | 122.05                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|----------|-------|--------------|
| 94                               | 1200.00                             | -0.00                              | 134.00              | 3.74                          | 2.20                 | 39.20               | 4.90                     | 44.10                    | -0.00    | -0.00 | -0.00        |
| 70                               | 1200.00                             | -0.00                              | 144.40              | 3.71                          | 3.30                 | 39.30               | 5.10                     | 44.40                    | -0.00    | -0.00 | -0.00        |
| 47                               | 1200.00                             | -0.00                              | 170.00              | 3.64                          | 3.60                 | 37.60               | 5.90                     | 43.50                    | -0.00    | -0.00 | -0.00        |
| 23                               | 1200.00                             | -0.00                              | 171.80              | 3.63                          | 3.00                 | 36.40               | 5.90                     | 42.30                    | -0.00    | -0.00 | -0.00        |
| 0                                | 1200.00                             | -0.00                              | 214.10              | 3.57                          | 4.30                 | 34.70               | 7.10                     | 41.70                    | -0.00    | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HP | MASS EMI<br>HC<br>LB/HP | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 94                               | 6.94                               | 0.06                               | -0.00                               | 3040.00                             | -0.00                              | 3.75                                | 1.81                    | 0.02                    | -0.00                    | 794.96                   | -0.00                   | 0.98                     |
| 70                               | 7.53                               | 0.10                               | -0.00                               | 3040.00                             | -0.00                              | 3.80                                | 1.90                    | 0.02                    | -0.00                    | 764.56                   | -0.00                   | 0.96                     |
| 47                               | 9.04                               | 0.11                               | -0.00                               | 3040.00                             | -0.00                              | 3.79                                | 2.23                    | 0.03                    | -0.00                    | 749.36                   | -0.00                   | 0.93                     |
| 23                               | 10.20                              | 0.09                               | -0.00                               | 3040.00                             | -0.00                              | 3.70                                | 2.46                    | 0.02                    | -0.00                    | 734.16                   | -0.00                   | 0.89                     |
| 0                                | 11.59                              | 0.13                               | -0.00                               | 3040.00                             | -0.00                              | 3.71                                | 2.69                    | 0.03                    | -0.00                    | 704.37                   | -0.00                   | 0.86                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 94                               | 8.319             | 3645.544               | 0.078              | -0.000            | -0.000                 | 4.496                  |
| 70                               | 9.098             | 3670.501               | 0.117              | -0.000            | -0.000                 | 4.594                  |
| 47                               | 11.580            | 3893.331               | 0.141              | -0.000            | -0.000                 | 4.856                  |
| 23                               | 14.355            | 4277.020               | 0.127              | -0.000            | -0.000                 | 5.204                  |
| 0                                | 18.099            | 4745.578               | 0.209              | -0.000            | -0.000                 | 5.796                  |

DATE: 5/10/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL 10 NUMBER: 51 ENGINE TYPE AND MODEL: GTC985-98 SERIAL NUMBER: P-15257

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 28.84 FINISH 28.84

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0013

RELATIVE HUMIDITY: 8.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SMP LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0                | 41000.00               | -0.00 | -0.00 | 116.80                             | -0.00                         | 0.007300                         | 84.00                                    | 54.90                                       | 0.0                     |
| 6/ 1         | 38.30       | 0.0                | 40900.00               | -0.00 | -0.00 | 136.50                             | -0.00                         | 0.008500                         | 84.00                                    | 55.20                                       | 0.0                     |
| 11/ 6        | 76.40       | 0.0                | 40800.00               | -0.00 | -0.00 | 158.80                             | -0.00                         | 0.010000                         | 85.00                                    | 54.90                                       | 0.0                     |
| 16/11        | 114.30      | 0.0                | 40700.00               | -0.00 | -0.00 | 182.00                             | -0.00                         | 0.011700                         | 85.00                                    | 54.60                                       | 0.0                     |
| 20/16        | 152.00      | 0.0                | 40600.00               | -0.00 | -0.00 | 219.50                             | -0.00                         | 0.013700                         | 90.90                                    | 54.00                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SNOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 530.00                              | -0.00                              | 288.60              | 1.47                          | 158.90               | 7.10                | 12.80                    | 19.90                    | -0.00     | -0.00 | -0.00        |
| 23                               | 610.00                              | -0.00                              | 269.10              | 1.71                          | 89.30                | 9.30                | 17.00                    | 26.40                    | -0.00     | -0.00 | -0.00        |
| 47                               | 695.00                              | -0.00                              | 263.50              | 2.02                          | 37.30                | 18.70               | 14.10                    | 32.80                    | -0.00     | -0.00 | -0.00        |
| 71                               | 785.00                              | -0.00                              | 253.80              | 2.37                          | 16.80                | 26.80               | 13.50                    | 40.20                    | -0.00     | -0.00 | -0.00        |
| 94                               | 910.00                              | -0.00                              | 219.10              | 2.78                          | 3.30                 | 36.70               | 12.20                    | 48.90                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 37.73                              | 11.88                              | -0.00                               | 3020.00                             | -0.00                              | 4.27                                | 4.41                    | 1.39                    | -0.00                    | 352.74                   | -0.00                   | 0.50                     |
| 23                               | 30.50                              | 5.79                               | -0.00                               | 3040.00                             | -0.00                              | 4.91                                | 4.16                    | 0.79                    | -0.00                    | 414.96                   | -0.00                   | 0.67                     |
| 47                               | 25.27                              | 2.04                               | -0.00                               | 3050.00                             | -0.00                              | 5.16                                | 4.01                    | 0.32                    | -0.00                    | 484.34                   | -0.00                   | 0.82                     |
| 71                               | 20.76                              | 0.79                               | -0.00                               | 3040.00                             | -0.00                              | 5.40                                | 3.78                    | 0.14                    | -0.00                    | 553.28                   | -0.00                   | 0.98                     |
| 94                               | 15.27                              | 0.13                               | -0.00                               | 3040.00                             | -0.00                              | 5.60                                | 3.35                    | 0.03                    | -0.00                    | 667.28                   | -0.00                   | 1.23                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                   |                        |                    |                   |                        |                        |
| 23                                           | 108.708           | 10834.461              | 20.621             | -0.000            | -0.000                 | 17.492                 |
| 47                                           | 52.525            | 6339.523               | 4.249              | -0.000            | -0.000                 | 10.731                 |
| 71                                           | 33.050            | 4840.594               | 1.253              | -0.000            | -0.000                 | 8.606                  |
| 94                                           | 22.057            | 4389.996               | 0.189              | -0.000            | -0.000                 | 8.088                  |

DATE: 5/18/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 70 ENGINE TYPE AND MODEL: GTCP85-98

SERIAL NUMBER: P-15257

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MDT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KERO

FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 28.84 FINISH 28.84

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0013

RELATIVE HUMIDITY: 8.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LR/MIN |
|--------------|-------------|--------------------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |                    | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 22/ 0        | 151.30      | 62.92              | 40400.00               | -0.00 | 270.00                             | -0.00                         | 0.018400                         | 85.00                                    | 53.50                                       | 45.64                   |
| 19/22        | 113.50      | 95.29              | 40400.00               | -0.00 | 270.00                             | -0.00                         | 0.019000                         | 86.00                                    | 52.00                                       | 70.85                   |
| 15/19        | 75.60       | 63.42              | 40400.00               | -0.00 | 274.00                             | -0.00                         | 0.018600                         | 88.00                                    | 53.20                                       | 45.99                   |
| 10/15        | 37.90       | 109.73             | 40500.00               | -0.00 | 262.00                             | -0.00                         | 0.019100                         | 88.00                                    | 50.60                                       | 83.42                   |
| 5/10         | 0.0         | 146.13             | 40560.00               | -0.00 | 242.00                             | -0.00                         | 0.018900                         | 88.00                                    | 48.20                                       | 116.49                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 94                               | 1200.00                             | -0.00                              | 120.80              | 3.74                          | 2.70                 | 59.90               | 5.40                     | 65.30                    | -0.00     | -0.00 | -0.00        |
| 70                               | 1200.00                             | -0.00                              | 122.70              | 3.85                          | 0.70                 | 58.00               | 5.40                     | 63.40                    | -0.00     | -0.00 | -0.00        |
| 47                               | 1200.00                             | -0.00                              | 125.50              | 3.78                          | 1.10                 | 60.10               | 6.30                     | 66.40                    | -0.00     | -0.00 | -0.00        |
| 23                               | 1200.00                             | -0.00                              | 117.00              | 3.87                          | 0.60                 | 59.30               | 5.40                     | 64.60                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1200.00                             | -0.00                              | 137.70              | 3.83                          | 0.80                 | 54.20               | 5.00                     | 59.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 94                               | 6.22                               | 0.08                               | -0.00                               | 3030.00                             | -0.00                              | 5.52                                | 1.68                    | 0.02                    | -0.00                    | 818.10                   | -0.00                   | 1.49                     |
| 70                               | 6.13                               | 0.02                               | -0.00                               | 3020.00                             | -0.00                              | 5.20                                | 1.66                    | 0.01                    | -0.00                    | 815.40                   | -0.00                   | 1.41                     |
| 47                               | 5.88                               | 0.03                               | -0.00                               | 3020.00                             | -0.00                              | 5.55                                | 1.61                    | 0.01                    | -0.00                    | 827.43                   | -0.00                   | 1.52                     |
| 23                               | 5.82                               | 0.02                               | -0.00                               | 3020.00                             | -0.00                              | 5.28                                | 1.53                    | 0.00                    | -0.00                    | 791.24                   | -0.00                   | 1.38                     |
| 0                                | 6.92                               | 0.02                               | -0.00                               | 3020.00                             | -0.00                              | 4.89                                | 1.67                    | 0.01                    | -0.00                    | 730.84                   | -0.00                   | 1.18                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 94                               | 7.836             | 3818.908               | 0.098              | -0.000            | -0.000                 | 6.951                  |
| 70                               | 7.927             | 3905.268               | 0.027              | -0.000            | -0.000                 | 6.729                  |
| 47                               | 11.585            | 5952.082               | 0.061              | -0.000            | -0.000                 | 10.942                 |
| 23                               | 10.331            | 5359.711               | 0.032              | -0.000            | -0.000                 | 9.378                  |
| 0                                | 11.457            | 5001.332               | 0.039              | -0.000            | -0.000                 | 8.098                  |

DATE: 5/21/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 52 ENGINE TYPE AND MODEL: GTC85-98 SERIAL NUMBER: P-15541  
 RATED SHAFT HORSEPOWER: 160.  
 ENGINE TOTAL TIME: 0. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: 0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS  
 FUEL: AV KEROS FUEL W/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 93.00 FINISH 93.00  
 ATMOSPHERIC PRESSURE: START 28.58 FINISH 28.58  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0033  
 RELATIVE HUMIDITY: 13.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
 SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST MODE | SHAFT HP | POWER AIR HP | ENGINE SPEED RPM | N1    | N2    | CORRECTED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | F/A CALC FROM EMISSIONS | COMPRESSOR INLET TEMP DEGREES F | COMPRESSOR DISCHARGE PRESSURE PSIA | BLEED FLOW LB/MIN |
|-----------|----------|--------------|------------------|-------|-------|---------------------------|-------------------------|-------------------------|---------------------------------|------------------------------------|-------------------|
| 1/ 0      | 0.0      | 0.0          | 41000.00         | -0.00 | -0.00 | 117.00                    | -0.00                   | 0.007000                | 88.00                           | 51.90                              | 0.0               |
| 6/ 1      | 38.10    | 0.0          | 40700.00         | -0.00 | -0.00 | 125.00                    | -0.00                   | 0.008400                | 92.00                           | 51.40                              | 0.0               |
| 11/ 6     | 76.00    | 0.0          | 40600.00         | -0.00 | -0.00 | 158.00                    | -0.00                   | 0.009900                | 95.00                           | 51.30                              | 0.0               |
| 16/ 11    | 113.50   | 0.0          | 40400.00         | -0.00 | -0.00 | 182.00                    | -0.00                   | 0.012000                | 96.00                           | 51.20                              | 0.0               |
| 20/ 16    | 150.90   | 0.0          | 40300.00         | -0.00 | -0.00 | 213.40                    | -0.00                   | 0.014500                | 95.00                           | 51.00                              | 0.0               |

| POWER PERCENT RATED SHP | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                       | 550.00                     | -0.00                     | 282.10        | 1.38                 | 222.10         | 8.20          | 13.10           | 18.30           | -0.00     | -0.00 | -0.00        |
| 23                      | 635.00                     | -0.00                     | 319.90        | 1.68                 | 169.80         | 9.20          | 15.00           | 24.20           | -0.00     | -0.00 | -0.00        |
| 47                      | 740.00                     | -0.00                     | 328.00        | 1.99                 | 121.90         | 14.70         | 15.30           | 30.00           | -0.00     | -0.00 | -0.00        |
| 70                      | 865.00                     | -0.00                     | 296.40        | 2.42                 | 73.60          | 23.90         | 13.80           | 37.70           | -0.00     | -0.00 | -0.00        |
| 94                      | 995.00                     | -0.00                     | 196.10        | 2.93                 | 54.10          | 40.40         | 7.70            | 48.10           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED SHP | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|-------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                       | 39.00                     | 17.55                     | -0.00                      | 3000.00                    | -0.00                     | 4.15                       | 4.56              | 2.05              | -0.00              | 351.00             | -0.00             | 0.49               |
| 23                      | 36.52                     | 11.08                     | -0.00                      | 3010.00                    | -0.00                     | 4.54                       | 4.56              | 1.38              | -0.00              | 376.25             | -0.00             | 0.57               |
| 47                      | 31.77                     | 6.75                      | -0.00                      | 3020.00                    | -0.00                     | 4.78                       | 5.02              | 1.07              | -0.00              | 477.16             | -0.00             | 0.75               |
| 70                      | 23.60                     | 3.35                      | -0.00                      | 3030.00                    | -0.00                     | 4.93                       | 4.30              | 0.61              | -0.00              | 551.46             | -0.00             | 0.90               |
| 94                      | 12.91                     | 2.04                      | -0.00                      | 3040.00                    | -0.00                     | 5.20                       | 2.76              | 0.43              | -0.00              | 648.74             | -0.00             | 1.11               |

| POWER PERCENT RATED SHP | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |         |          |        |        |        |        |
|----|---------|----------|--------|--------|--------|--------|
| 23 | 119.803 | 9875.316 | 36.348 | -0.000 | -0.000 | 14.905 |
| 47 | 66.056  | 6278.418 | 14.027 | -0.000 | -0.000 | 9.929  |
| 70 | 37.848  | 4858.676 | 5.372  | -0.000 | -0.000 | 7.907  |
| 94 | 18.264  | 4299.109 | 2.882  | -0.000 | -0.000 | 7.354  |

DATE: 5/21/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 71 ENGINE TYPE AND MODEL: GTCB85-98 SERIAL NUMBER: P-19541

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROZ FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 97.00 FINISH 97.00

ATMOSPHERIC PRESSURE: START 28.58 FINISH 28.58

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0033

RELATIVE HUMIDITY: 13.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 149.80      | 52.05              | 40000.00               | -0.00 | -0.00 | 258.30                             | -0.00                         | 0.019500                         | 96.00                                    | 49.00                                       | 40.24                   |
| 19/22        | 112.10      | 83.87              | 39900.00               | -0.00 | -0.00 | 253.40                             | -0.00                         | 0.019500                         | 98.00                                    | 48.00                                       | 65.93                   |
| 15/19        | 74.70       | 104.11             | 39900.00               | -0.00 | -0.00 | 248.40                             | -0.00                         | 0.019500                         | 98.00                                    | 46.90                                       | 83.77                   |
| 10/15        | 37.40       | 122.03             | 40000.00               | -0.00 | -0.00 | 243.40                             | -0.00                         | 0.019200                         | 97.00                                    | 45.70                                       | 101.01                  |
| 5/10         | 0.0         | 134.53             | 40000.00               | -0.00 | -0.00 | 233.40                             | -0.00                         | 0.019100                         | 96.00                                    | 44.00                                       | 116.07                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 93                               | 1250.00                             | -0.00                              | 90.10               | 3.96                          | 45.20                | 61.10               | 4.90                     | 66.00                    | -0.00     | -0.00 | -0.00        |
| 70                               | 1250.00                             | -0.00                              | 100.90              | 3.95                          | 68.30                | 61.30               | 5.10                     | 66.40                    | -0.00     | -0.00 | -0.00        |
| 46                               | 1250.00                             | -0.00                              | 109.20              | 3.94                          | 57.60                | 59.80               | 4.60                     | 64.40                    | -0.00     | -0.00 | -0.00        |
| 23                               | 1250.00                             | -0.00                              | 114.50              | 3.89                          | 80.10                | 59.60               | 4.10                     | 63.70                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1250.00                             | -0.00                              | 127.60              | 3.86                          | 56.60                | 56.30               | 4.60                     | 60.90                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 93                               | 4.37                               | 1.25                               | -0.00                               | 3020.00                             | -0.00                              | 5.26                                | 1.13                    | 0.32                    | -0.00                    | 780.06                   | -0.00                   | 1.36                     |
| 70                               | 4.90                               | 1.90                               | -0.00                               | 3020.00                             | -0.00                              | 5.30                                | 1.24                    | 0.48                    | -0.00                    | 765.27                   | -0.00                   | 1.34                     |
| 46                               | 5.32                               | 1.60                               | -0.00                               | 3020.00                             | -0.00                              | 5.15                                | 1.32                    | 0.40                    | -0.00                    | 750.17                   | -0.00                   | 1.28                     |
| 23                               | 5.65                               | 2.26                               | -0.00                               | 3020.00                             | -0.00                              | 5.16                                | 1.37                    | 0.55                    | -0.00                    | 735.07                   | -0.00                   | 1.26                     |
| 0                                | 6.35                               | 1.61                               | -0.00                               | 3020.00                             | -0.00                              | 4.99                                | 1.48                    | 0.38                    | -0.00                    | 704.97                   | -0.00                   | 1.16                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 93                               | 5.593             | 3864.502               | 1.606              | -0.000            | -0.000                 | 6.732                  |
| 70                               | 6.333             | 3905.093               | 2.453              | -0.000            | -0.000                 | 6.851                  |
| 46                               | 7.385             | 4195.363               | 2.228              | -0.000            | -0.000                 | 7.156                  |
| 23                               | 8.619             | 4610.492               | 3.446              | -0.000            | -0.000                 | 7.876                  |
| 0                                | 11.022            | 5239.453               | 2.791              | -0.000            | -0.000                 | 8.452                  |

DATE: 5/13/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 53 ENGINE TYPE AND MODEL: GTCP85-115 SERIAL NUMBER: P-18725

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 92.00 FINISH 92.00

ATMOSPHERIC PRESSURE: START 28.78 FINISH 28.78

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0059

RELATIVE HUMIDITY: 25.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST MODE | SHAFT HP | POWER AIR HP | ENGINE SPEED RPM | CORRECTED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | F/A CALC FROM EMISSIONS | COMPRESSOR INLET TEMP DEGREES F | COMPRESSOR DISCHARGE PRESSURE PSIA | BLEED FLOW LB/MIN |     |
|-----------|----------|--------------|------------------|---------------------------|-------------------------|-------------------------|---------------------------------|------------------------------------|-------------------|-----|
|           |          |              | N1 N2            |                           |                         |                         |                                 |                                    |                   |     |
| 1/ 0      | 0.0      | 0.0          | 41100.00         | -0.00                     | 110.60                  | -0.00                   | 0.006400                        | 82.00                              | 64.10             | 0.0 |
| 6/ 1      | 38.20    | 0.0          | 40800.00         | -0.00                     | 121.70                  | -0.00                   | 0.007700                        | 85.00                              | 62.90             | 0.0 |
| 11/ 6     | 76.00    | 0.0          | 40600.00         | -0.00                     | 155.90                  | -0.00                   | 0.009700                        | 93.00                              | 61.00             | 0.0 |
| 16/11     | 113.70   | 0.0          | 40500.00         | -0.00                     | 185.30                  | -0.00                   | 0.012400                        | 105.00                             | 58.10             | 0.0 |
| 20/16     | 151.30   | 0.0          | 40400.00         | -0.00                     | 215.80                  | -0.00                   | 0.014000                        | 96.00                              | 61.90             | 0.0 |

| POWER PERCENT RATED SHP | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                       | 520.00                     | -0.00                     | 196.10        | 1.30                 | 58.20          | 5.40          | 10.80           | 16.10           | -0.00     | -0.00 | -0.00        |
| 23                      | 615.00                     | -0.00                     | 215.90        | 1.56                 | 54.70          | 8.70          | 11.90           | 20.50           | -0.00     | -0.00 | -0.00        |
| 47                      | 740.00                     | -0.00                     | 211.40        | 1.94                 | 27.00          | 19.50         | 9.50            | 29.10           | -0.00     | -0.00 | -0.00        |
| 71                      | 900.00                     | -0.00                     | 221.10        | 2.52                 | 13.30          | 32.00         | 8.70            | 40.70           | -0.00     | -0.00 | -0.00        |
| 94                      | 1010.00                    | -0.00                     | 217.20        | 2.86                 | 6.90           | 39.80         | 4.70            | 44.50           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED SHP | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|-------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                       | 29.42                     | 4.99                      | -0.00                      | 3070.00                    | -0.00                     | 3.97                       | 3.25              | 0.55              | -0.00              | 339.54             | -0.00             | 0.44               |
| 23                      | 27.00                     | 3.91                      | -0.00                      | 3070.00                    | -0.00                     | 4.22                       | 3.29              | 0.48              | -0.00              | 373.62             | -0.00             | 0.51               |
| 47                      | 20.82                     | 1.52                      | -0.00                      | 3070.00                    | -0.00                     | 4.70                       | 3.25              | 0.24              | -0.00              | 478.61             | -0.00             | 0.73               |
| 71                      | 17.07                     | 0.59                      | -0.00                      | 3060.00                    | -0.00                     | 5.16                       | 3.16              | 0.11              | -0.00              | 567.02             | -0.00             | 0.96               |
| 94                      | 14.79                     | 0.27                      | -0.00                      | 3050.00                    | -0.00                     | 4.98                       | 3.19              | 0.06              | -0.00              | 658.19             | -0.00             | 1.07               |

| POWER PERCENT RATED SHP | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |          |        |        |        |        |
|----|--------|----------|--------|--------|--------|--------|
| 23 | 86.015 | 9780.594 | 12.447 | -0.000 | -0.000 | 13.444 |
| 47 | 42.704 | 6297.535 | 3.114  | -0.000 | -0.000 | 9.649  |
| 71 | 27.824 | 4986.961 | 0.957  | -0.000 | -0.000 | 8.411  |
| 94 | 21.089 | 4350.227 | 0.382  | -0.000 | -0.000 | 7.103  |

DATE: 5/19/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 72 ENGINE TYPE AND MODEL: GTCB5-115 SERIAL NUMBER: P-18725  
RATED SHAFT HORSEPOWER: 160.  
ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 107.00 FINISH 107.00  
ATMOSPHERIC PRESSURE: START 28.78 FINISH 28.78  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0059  
RELATIVE HUMIDITY: 25.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 150.90               | 49.73     | 40300.00               | -0.00                              | 254.50                        | -0.00                            | 0.017600                                 | 102.00                                      | 33.08                   |
| 19/22        | 113.20               | 71.74     | 40300.00               | -0.00                              | 246.40                        | -0.00                            | 0.017400                                 | 102.00                                      | 49.86                   |
| 15/19        | 75.60                | 93.73     | 40400.00               | -0.00                              | 234.20                        | -0.00                            | 0.016900                                 | 114.00                                      | 65.58                   |
| 10/15        | 37.80                | 116.13    | 40400.00               | -0.00                              | 233.20                        | -0.00                            | 0.017400                                 | 109.00                                      | 85.03                   |
| 5/10         | 0.0                  | 0.0       | 0.0                    | -0.00                              | -0.00                         | -0.00                            | 0.017200                                 | -0.00                                       | 7.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 94                               | 1200.00                             | -0.00                              | 161.80              | 3.58                          | 3.00                 | 48.50               | 5.70                     | 54.10                    | -0.00     | -0.00 | -0.00        |
| 70                               | 1200.00                             | -0.00                              | 200.40              | 3.54                          | 3.30                 | 49.90               | 5.60                     | 55.50                    | -0.00     | -0.00 | -0.00        |
| 47                               | 1195.00                             | -0.00                              | 226.70              | 3.43                          | 4.40                 | 46.60               | 5.80                     | 52.40                    | -0.00     | -0.00 | -0.00        |
| 23                               | 1200.00                             | -0.00                              | 243.10              | 3.54                          | 5.00                 | 48.40               | 6.70                     | 55.10                    | -0.00     | -0.00 | -0.00        |
| 0                                | 0.0                                 | -0.00                              | 264.30              | 3.48                          | 8.00                 | 45.10               | 7.50                     | 52.60                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 94                               | 8.74                               | 0.09                               | -0.00                               | 3040.00                             | -0.00                              | 4.80                                | 2.22                    | 0.02                    | -0.00                    | 773.68                   | -0.00                   | 1.22                     |
| 70                               | 10.95                              | 0.10                               | -0.00                               | 3040.00                             | -0.00                              | 4.98                                | 2.70                    | 0.03                    | -0.00                    | 749.06                   | -0.00                   | 1.23                     |
| 47                               | 12.80                              | 0.14                               | -0.00                               | 3040.00                             | -0.00                              | 4.86                                | 3.00                    | 0.03                    | -0.00                    | 711.97                   | -0.00                   | 1.14                     |
| 23                               | 13.26                              | 0.16                               | -0.00                               | 3030.00                             | -0.00                              | 4.93                                | 3.09                    | 0.04                    | -0.00                    | 706.60                   | -0.00                   | 1.15                     |
| 0                                | 14.65                              | 0.25                               | -0.00                               | 3030.00                             | -0.00                              | 4.79                                | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 94                               | 11.085            | 3856.163               | 0.119              | -0.000            | -0.000                 | 6.092                  |
| 70                               | 14.594            | 4050.263               | 0.139              | -0.000            | -0.000                 | 6.638                  |
| 47                               | 17.700            | 4204.504               | 0.198              | -0.000            | -0.000                 | 6.722                  |
| 23                               | 20.084            | 4590.340               | 0.236              | -0.000            | -0.000                 | 7.475                  |

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

DATE: 6/ 8/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 54 ENGINE TYPE AND MODEL: GTC85-115 SERIAL NUMBER: P-18781

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROSENE FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 93.00 FINISH 93.00

ATMOSPHERIC PRESSURE: START 28.72 FINISH 28.72

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |                      |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0                  | 0.0       | 41200.00               | -0.00 | 121.60                             | -0.00                         | 0.006600                         | 92.00                                    | 53.50                                       | 0.0                     |
| 6/ 1         | 38.60                | 0.0       | 41200.00               | -0.00 | 139.00                             | -0.00                         | 0.008300                         | 91.00                                    | 54.40                                       | 0.0                     |
| 11/ 6        | 77.10                | 0.0       | 41200.00               | -0.00 | 161.00                             | -0.00                         | 0.010000                         | 91.00                                    | 54.40                                       | 0.0                     |
| 16/11        | 115.10               | 0.0       | 41000.00               | -0.00 | 186.20                             | -0.00                         | 0.011800                         | 94.00                                    | 54.10                                       | 0.0                     |
| 20/16        | 153.10               | 0.0       | 40900.00               | -0.00 | 216.50                             | -0.00                         | 0.013600                         | 96.00                                    | 53.90                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 545.00                              | -0.00                              | 194.60              | 1.33                          | 62.00                | 3.70                | 7.50                     | 11.10                    | -0.00     | -0.00 | -0.00        |
| 24                               | 620.00                              | -0.00                              | 221.20              | 1.68                          | 6.45                 | 5.80                | 8.90                     | 14.70                    | -0.00     | -0.00 | -0.00        |
| 48                               | 710.00                              | -0.00                              | 254.70              | 2.03                          | 53.80                | 10.60               | 11.40                    | 22.00                    | -0.00     | -0.00 | -0.00        |
| 71                               | 820.00                              | -0.00                              | 275.20              | 2.38                          | 38.50                | 14.70               | 10.80                    | 25.40                    | -0.00     | -0.00 | -0.00        |
| 95                               | 960.00                              | -0.00                              | 259.50              | 2.76                          | 22.70                | 22.80               | 9.50                     | 32.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 28.33                              | 5.16                               | -0.00                               | 3050.00                             | -0.00                              | 2.66                                | 3.44                    | 0.63                    | -0.00                    | 370.88                   | -0.00                   | 0.32                     |
| 24                               | 25.51                              | 4.25                               | -0.00                               | 3050.00                             | -0.00                              | 2.79                                | 3.55                    | 0.59                    | -0.00                    | 423.95                   | -0.00                   | 0.39                     |
| 48                               | 24.30                              | 2.93                               | -0.00                               | 3040.00                             | -0.00                              | 3.44                                | 3.91                    | 0.47                    | -0.00                    | 489.44                   | -0.00                   | 0.55                     |
| 71                               | 22.38                              | 1.79                               | -0.00                               | 3040.00                             | -0.00                              | 3.40                                | 4.17                    | 0.33                    | -0.00                    | 566.05                   | -0.00                   | 0.63                     |
| 95                               | 18.15                              | 0.91                               | -0.00                               | 3040.00                             | -0.00                              | 3.71                                | 3.93                    | 0.20                    | -0.00                    | 658.16                   | -0.00                   | 0.80                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |           |        |        |        |        |
|----|--------|-----------|--------|--------|--------|--------|
| 24 | 91.870 | 10983.148 | 15.319 | -0.000 | -0.000 | 10.036 |
| 48 | 50.735 | 6349.113  | 6.127  | -0.000 | -0.000 | 7.188  |
| 71 | 36.213 | 4917.875  | 2.899  | -0.000 | -0.000 | 5.500  |
| 95 | 25.662 | 4298.887  | 1.281  | -0.000 | -0.000 | 5.246  |

DATE: 6/ 8/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 73 ENGINE TYPE AND MODEL: GTCPS-115 SERIAL NUMBER: P-18781

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KERO

FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 107.00 FINISH 107.00

ATMOSPHERIC PRESSURE: START 28.72 FINISH 28.72

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 15.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|----------------------|-----------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 27/ 0        | 152.40               | 61.69     | 40700.00               | -0.00 | -0.00 | 281.50                             | -0.00                         | 0.018300                         | 100.00                                   | 51.90                                       | 44.80                   |
| 19/22        | 114.30               | 80.08     | 40700.00               | -0.00 | -0.00 | 266.50                             | -0.00                         | 0.018000                         | 110.00                                   | 50.20                                       | 58.98                   |
| 15/19        | 76.20                | 104.53    | 40700.00               | -0.00 | -0.00 | 256.50                             | -0.00                         | 0.017900                         | 108.00                                   | 48.70                                       | 79.58                   |
| 10/15        | 38.20                | 121.75    | 40800.00               | -0.00 | -0.00 | 251.50                             | -0.00                         | 0.017800                         | 108.00                                   | 47.00                                       | 96.03                   |
| 5/10         | 0.0                  | 136.45    | 40800.00               | -0.00 | -0.00 | 241.50                             | -0.00                         | 0.017700                         | 108.00                                   | 45.30                                       | 111.77                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 95                               | 1250.00                             | -0.00                              | 144.80              | 3.72                          | 5.30                 | 37.50               | 4.90                     | 42.40                    | -0.00     | -0.00 | -0.00        |
| 71                               | 1250.00                             | -0.00                              | 164.60              | 3.65                          | 12.80                | 37.00               | 5.20                     | 42.30                    | -0.00     | -0.00 | -0.00        |
| 47                               | 1250.00                             | -0.00                              | 181.50              | 3.63                          | 14.30                | 35.30               | 6.70                     | 41.90                    | -0.00     | -0.00 | -0.00        |
| 23                               | 1250.00                             | -0.00                              | 213.70              | 3.61                          | 19.00                | 34.90               | 6.70                     | 41.60                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1250.00                             | -0.00                              | 261.00              | 3.58                          | 23.20                | 32.00               | 8.10                     | 40.10                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 95                               | 7.49                               | 0.16                               | -0.00                               | 3020.00                             | -0.00                              | 3.60                                | 2.11                    | 0.04                    | -0.00                    | 850.13                   | -0.00                   | 1.01                     |
| 71                               | 8.69                               | 0.39                               | -0.00                               | 3020.00                             | -0.00                              | 3.67                                | 2.32                    | 0.10                    | -0.00                    | 804.93                   | -0.00                   | 0.98                     |
| 47                               | 9.61                               | 0.43                               | -0.00                               | 3020.00                             | -0.00                              | 3.65                                | 2.47                    | 0.11                    | -0.00                    | 774.63                   | -0.00                   | 0.94                     |
| 23                               | 11.38                              | 0.58                               | -0.00                               | 3020.00                             | -0.00                              | 3.64                                | 2.86                    | 0.15                    | -0.00                    | 759.53                   | -0.00                   | 0.91                     |
| 0                                | 13.99                              | 0.71                               | -0.00                               | 3020.00                             | -0.00                              | 3.53                                | 3.38                    | 0.17                    | -0.00                    | 729.33                   | -0.00                   | 0.85                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 95                               | 9.850             | 3970.900               | 0.205              | -0.000            | -0.000                 | 4.736                  |
| 71                               | 11.910            | 4140.488               | 0.531              | -0.000            | -0.000                 | 5.026                  |
| 47                               | 13.644            | 4286.059               | 0.613              | -0.000            | -0.000                 | 5.177                  |
| 23                               | 17.892            | 4748.660               | 0.907              | -0.000            | -0.000                 | 5.717                  |
| 0                                | 24.753            | 5344.934               | 1.260              | -0.000            | -0.000                 | 6.249                  |

DATE: 6/11/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 55 ENGINE TYPE AND MODEL: GTCB5-115 SERIAL NUMBER: P-18702

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.990

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 94.00 FINISH 94.00

ATMOSPHERIC PRESSURE: START 28.00 FINISH 28.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0045

RELATIVE HUMIDITY: 17.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHF LOADING ONLY

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0                | 41200.00               | -0.00 | -0.00 | 116.40                             | -0.00                         | 0.006800                         | 87.00                                    | 53.50                                       | 0.0                     |
| 6/ 1         | 38.60       | 0.0                | 41200.00               | -0.00 | -0.00 | 138.00                             | -0.00                         | 0.007900                         | 90.00                                    | 53.30                                       | 0.0                     |
| 11/ 6        | 76.90       | 0.0                | 41100.00               | -0.00 | -0.00 | 158.00                             | -0.00                         | 0.009600                         | 94.00                                    | 53.00                                       | 0.0                     |
| 16/11        | 115.10      | 0.0                | 41000.00               | -0.00 | -0.00 | 183.20                             | -0.00                         | 0.011700                         | 98.00                                    | 52.60                                       | 0.0                     |
| 20/16        | 153.50      | 0.0                | 41000.00               | -0.00 | -0.00 | 212.00                             | -0.00                         | 0.013300                         | 103.00                                   | 52.30                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHF | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 540.00                              | -0.00                              | 195.00              | 1.37                          | 55.80                | 7.70                | 7.80                     | 15.50                    | -0.00     | -0.00 | -0.00        |
| 24                               | 620.00                              | -0.00                              | 235.40              | 1.60                          | 54.90                | 10.80               | 9.80                     | 20.60                    | -0.00     | -0.00 | -0.00        |
| 48                               | 705.00                              | -0.00                              | 279.10              | 1.93                          | 48.10                | 18.20               | 8.00                     | 26.20                    | -0.00     | -0.00 | -0.00        |
| 71                               | 830.00                              | -0.00                              | 301.60              | 2.35                          | 31.20                | 27.00               | 6.80                     | 33.80                    | -0.00     | -0.00 | -0.00        |
| 95                               | 955.00                              | -0.00                              | 259.30              | 2.69                          | 18.30                | 35.30               | 6.60                     | 41.90                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHF | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 27.47                              | 4.49                               | -0.00                               | 3040.00                             | -0.00                              | 3.59                                | 3.20                    | 0.52                    | -0.00                    | 353.86                   | -0.00                   | 0.42                     |
| 24                               | 28.44                              | 3.79                               | -0.00                               | 3030.00                             | -0.00                              | 4.10                                | 3.92                    | 0.52                    | -0.00                    | 418.14                   | -0.00                   | 0.57                     |
| 48                               | 27.84                              | 2.74                               | -0.00                               | 3030.00                             | -0.00                              | 4.30                                | 4.40                    | 0.43                    | -0.00                    | 478.74                   | -0.00                   | 0.68                     |
| 71                               | 24.65                              | 1.46                               | -0.00                               | 3020.00                             | -0.00                              | 4.53                                | 4.52                    | 0.27                    | -0.00                    | 553.26                   | -0.00                   | 0.83                     |
| 95                               | 18.57                              | 0.75                               | -0.00                               | 3020.00                             | -0.00                              | 4.93                                | 3.94                    | 0.16                    | -0.00                    | 640.24                   | -0.00                   | 1.05                     |

| POWER<br>PERCENT<br>RATED<br>SHF | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
|----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |         |           |        |        |        |        |
|----|---------|-----------|--------|--------|--------|--------|
| 24 | 101.684 | 10832.637 | 11.557 | -0.000 | -0.000 | 14.644 |
| 48 | 57.209  | 6225.484  | 5.630  | -0.000 | -0.000 | 8.835  |
| 71 | 39.236  | 4806.809  | 2.319  | -0.000 | -0.000 | 7.218  |
| 95 | 25.646  | 4170.941  | 1.034  | -0.000 | -0.000 | 6.814  |

DATE: 6/11/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 74 ENGINE TYPE AND MODEL: GTCPS-115 SERIAL NUMBER: P-18702  
RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.990

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 112.00 FINISH 112.00

ATMOSPHERIC PRESSURE: START 28.00 FINISH 28.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0045

RELATIVE HUMIDITY: 17.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |                    | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 22/ 0        | 152.40      | 56.88              | 40700.00               | -0.00 | 266.50                             | -0.00                         | 0.018800                         | 110.00                                   | 50.10                                       | 41.97                   |
| 19/22        | 114.30      | 87.22              | 40700.00               | -0.00 | 262.50                             | -0.00                         | 0.018700                         | 112.00                                   | 48.60                                       | 46.07                   |
| 15/19        | 76.40       | 107.13             | 40800.00               | -0.00 | 246.50                             | -0.00                         | 0.018600                         | 114.00                                   | 46.90                                       | 43.80                   |
| 10/15        | 38.10       | 121.16             | 40700.00               | -0.00 | 241.50                             | -0.00                         | 0.018200                         | 110.00                                   | 45.10                                       | 49.35                   |
| 5/10         | 0.0         | 139.03             | 40800.00               | -0.00 | 232.50                             | -0.00                         | 0.018800                         | 114.00                                   | 43.70                                       | 117.04                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 95                               | 1250.00                             | -0.00                              | 192.20              | 3.78                          | 9.90                 | 58.30               | 5.60                     | 63.90                    | -0.00     | -0.00 | -0.00        |
| 71                               | 1250.00                             | -0.00                              | 206.60              | 3.76                          | 11.80                | 56.80               | 5.80                     | 62.50                    | -0.00     | -0.00 | -0.00        |
| 47                               | 1250.00                             | -0.00                              | 245.50              | 3.74                          | 13.40                | 58.10               | 4.70                     | 62.80                    | -0.00     | -0.00 | -0.00        |
| 23                               | 1250.00                             | -0.00                              | 243.40              | 3.66                          | 13.90                | 54.40               | 7.10                     | 61.50                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1248.00                             | -0.00                              | 245.60              | 3.77                          | 12.50                | 54.10               | 6.20                     | 60.30                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 95                               | 9.70                               | 0.28                               | -0.00                               | 3000.00                             | -0.00                              | 5.30                                | 2.59                    | 0.08                    | -0.00                    | 799.50                   | -0.00                   | 1.41                     |
| 71                               | 10.49                              | 0.34                               | -0.00                               | 3000.00                             | -0.00                              | 5.22                                | 2.75                    | 0.09                    | -0.00                    | 787.50                   | -0.00                   | 1.37                     |
| 47                               | 12.50                              | 0.39                               | -0.00                               | 3000.00                             | -0.00                              | 5.25                                | 3.08                    | 0.10                    | -0.00                    | 739.50                   | -0.00                   | 1.30                     |
| 23                               | 12.68                              | 0.41                               | -0.00                               | 3000.00                             | -0.00                              | 5.26                                | 3.06                    | 0.10                    | -0.00                    | 724.50                   | -0.00                   | 1.27                     |
| 0                                | 12.42                              | 0.36                               | -0.00                               | 3000.00                             | -0.00                              | 5.01                                | 2.89                    | 0.08                    | -0.00                    | 697.50                   | -0.00                   | 1.17                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                  |                   |                        |                    |                   |                        |                        |
| 95                               | 12.357            | 3820.327               | 0.362              | -0.000            | -0.000                 | 6.744                  |
| 71                               | 13.669            | 3907.790               | 0.447              | -0.000            | -0.000                 | 6.797                  |
| 47                               | 16.795            | 4029.263               | 0.525              | -0.000            | -0.000                 | 7.058                  |
| 23                               | 19.236            | 4549.227               | 0.628              | -0.000            | -0.000                 | 7.984                  |
| 0                                | 20.763            | 5016.887               | 0.604              | -0.000            | -0.000                 | 8.380                  |

DATE: 4/28/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 56 ENGINE TYPE AND MODEL: GTCP85-129 SERIAL NUMBER: P-34763

RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 FUEL W/C RATIO: 1.990

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 28.68 FINISH 28.68

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0036

RELATIVE HUMIDITY: 23.00 PERCFNT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

SHP LOADING ONLY

| TEST MODE | POWER<br>SHAFT<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|-----------|----------------------|-----------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0      | 0.0                  | 0.0       | 41400.00               | -0.00 | -0.00 | 111.00                             | -0.00                         | 0.006100                         | 82.00                                    | -0.00                                       | 0.0                     |
| 6/ 1      | 40.80                | 0.0       | 41500.00               | -0.00 | -0.00 | 129.00                             | -0.00                         | 0.007500                         | 84.00                                    | -0.00                                       | 0.0                     |
| 11/ 6     | 78.50                | 0.0       | 41400.00               | -0.00 | -0.00 | 148.00                             | -0.00                         | 0.008700                         | 84.00                                    | -0.00                                       | 0.0                     |
| 16/11     | 116.90               | 0.0       | 41300.00               | -0.00 | -0.00 | 169.00                             | -0.00                         | 0.008900                         | 87.00                                    | -0.00                                       | 0.0                     |
| 20/16     | 155.20               | 0.0       | 41200.00               | -0.00 | -0.00 | 203.50                             | -0.00                         | 0.011800                         | 89.00                                    | -0.00                                       | 0.0                     |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 530.00                              | -0.00                              | 149.20              | 1.22                          | 43.50                | 7.50                | 13.80                    | 21.30                    | -0.00     | -0.00 | -0.00        |
| 25                               | 590.00                              | -0.00                              | 172.80              | 1.52                          | 37.10                | 9.10                | 13.50                    | 22.50                    | -0.00     | -0.00 | -0.00        |
| 49                               | 655.00                              | -0.00                              | 181.00              | 1.77                          | 27.80                | 13.20               | 14.20                    | 27.40                    | -0.00     | -0.00 | -0.00        |
| 73                               | 735.00                              | -0.00                              | 194.60              | 1.80                          | 22.90                | 17.30               | 15.40                    | 32.70                    | -0.00     | -0.00 | -0.00        |
| 96                               | 850.00                              | -0.00                              | 187.50              | 2.39                          | 12.70                | 24.90               | 15.20                    | 40.10                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 23.68                              | 3.94                               | -0.00                               | 3050.00                             | -0.00                              | 5.56                                | 2.63                    | 0.44                    | -0.00                    | 338.55                   | -0.00                   | 0.62                     |
| 25                               | 22.00                              | 2.70                               | -0.00                               | 3050.00                             | -0.00                              | 4.71                                | 2.84                    | 0.35                    | -0.00                    | 393.45                   | -0.00                   | 0.61                     |
| 49                               | 19.88                              | 1.74                               | -0.00                               | 3050.00                             | -0.00                              | 4.94                                | 2.94                    | 0.26                    | -0.00                    | 451.40                   | -0.00                   | 0.73                     |
| 73                               | 21.01                              | 1.41                               | -0.00                               | 3050.00                             | -0.00                              | 5.80                                | 3.55                    | 0.24                    | -0.00                    | 515.45                   | -0.00                   | 0.98                     |
| 96                               | 15.17                              | 0.59                               | -0.00                               | 3040.00                             | -0.00                              | 5.33                                | 3.09                    | 0.12                    | -0.00                    | 618.64                   | -0.00                   | 1.08                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|    |        |          |       |        |        |        |
|----|--------|----------|-------|--------|--------|--------|
| 25 | 69.562 | 9643.379 | 8.540 | -0.000 | -0.000 | 14.498 |
| 49 | 37.475 | 5750.313 | 3.286 | -0.000 | -0.000 | 9.308  |
| 73 | 30.377 | 4409.320 | 2.046 | -0.000 | -0.000 | 8.382  |
| 96 | 19.886 | 3986.082 | 0.768 | -0.000 | -0.000 | 6.990  |

DATE: 4/28/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 75 ENGINE TYPE AND MODEL: GTCP85-129 SERIAL NUMBER: P-34763  
RATED SHAFT HORSEPOWER: 160.

ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.990

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00  
ATMOSPHERIC PRESSURE: START 28.68 FINISH 28.68  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0036  
RELATIVE HUMIDITY: 23.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

COMBINATION SHP/BLEED LOADING

| TEST<br>MODE | SHAFT<br>HP | POWER<br>AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------------------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 22/ 0        | 153.40      | -0.00              | 10700.00               | -0.00 | -0.00 | 283.20                             | -0.00                         | 0.018600                         | 88.00                                    | -0.00                                       | 58.12                   |
| 19/22        | 115.50      | -0.00              | 40800.00               | -0.00 | -0.00 | 276.20                             | -0.00                         | 0.018500                         | 88.00                                    | -0.00                                       | 79.68                   |
| 15/19        | 78.50       | -0.00              | 40900.00               | -0.00 | -0.00 | 259.40                             | -0.00                         | 0.017400                         | 88.00                                    | -0.00                                       | 88.84                   |
| 9/15         | 39.20       | -0.00              | 40900.00               | -0.00 | -0.00 | 239.50                             | -0.00                         | 0.016400                         | 88.00                                    | -0.00                                       | 98.34                   |
| 4/ 9         | 0.0         | -0.00              | 40900.00               | -0.00 | -0.00 | 226.50                             | -0.00                         | 0.016100                         | 86.00                                    | -0.00                                       | 108.91                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 95                               | 1250.00                             | -0.00                              | 130.10              | 3.75                          | 2.10                 | 61.80               | 9.50                     | 71.20                    | -0.00     | -0.00 | -0.00        |
| 72                               | 1230.00                             | -0.00                              | 138.40              | 3.74                          | 3.00                 | 59.30               | 9.40                     | 68.60                    | -0.00     | -0.00 | -0.00        |
| 49                               | 1175.00                             | -0.00                              | 160.80              | 3.50                          | 3.00                 | 51.60               | 11.60                    | 63.20                    | -0.00     | -0.00 | -0.00        |
| 24                               | 1130.00                             | -0.00                              | 203.10              | 3.31                          | 5.40                 | 44.50               | 14.00                    | 58.40                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1100.00                             | -0.00                              | 222.20              | 3.24                          | 5.40                 | 41.50               | 14.90                    | 56.40                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 95                               | 6.63                               | 0.06                               | -0.00                               | 3010.00                             | -0.00                              | 5.96                                | 1.88                    | 0.02                    | -0.00                    | 852.43                   | -0.00                   | 1.69                     |
| 72                               | 7.09                               | 0.09                               | -0.00                               | 3010.00                             | -0.00                              | 5.77                                | 1.96                    | 0.02                    | -0.00                    | 831.36                   | -0.00                   | 1.59                     |
| 49                               | 8.80                               | 0.09                               | -0.00                               | 3010.00                             | -0.00                              | 5.68                                | 2.28                    | 0.02                    | -0.00                    | 780.79                   | -0.00                   | 1.47                     |
| 24                               | 11.77                              | 0.18                               | -0.00                               | 3010.00                             | -0.00                              | 5.56                                | 2.82                    | 0.04                    | -0.00                    | 720.89                   | -0.00                   | 1.33                     |
| 0                                | 13.17                              | 0.18                               | -0.00                               | 3010.00                             | -0.00                              | 5.49                                | 2.98                    | 0.04                    | -0.00                    | 681.76                   | -0.00                   | 1.24                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*  
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\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

DATE: 5/18/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 57 ENGINE TYPE AND MODEL: GTC85-90 SERIAL NUMBER: P-5786

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 28.79 FINISH 28.79

INLET AIR HUMIDITY, LBS H2O/LR AIR: 0.0026

RELATIVE HUMIDITY: 16.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

NO SHP DATA

PROBE LOCATIONS 1-10

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | N1    | N2    | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|-------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
| 1/ 0         | 0.0         | 0.0         | 0.0       | 41200.00               | -0.00 | -0.00 | 107.90                             | -0.00                         | 0.007500                         | 78.00                                    | 51.70                                       | 0.0                     |
| 2/ 1         | 0.0         | 55.84       | 55.84     | 41100.00               | -0.00 | -0.00 | 139.20                             | -0.00                         | 0.010100                         | 80.00                                    | 50.20                                       | 43.41                   |
| 3/ 2         | 0.0         | 85.92       | 85.92     | 40900.00               | -0.00 | -0.00 | 164.20                             | -0.00                         | 0.012300                         | 80.00                                    | 48.70                                       | 68.80                   |
| 4/ 3         | 0.0         | 106.99      | 106.99    | 40800.00               | -0.00 | -0.00 | 184.50                             | -0.00                         | 0.014800                         | 85.00                                    | 46.80                                       | 88.33                   |
| 5/ 4         | 0.0         | 114.34      | 114.34    | 40700.00               | -0.00 | -0.00 | 216.20                             | -0.00                         | 0.018100                         | 92.00                                    | 40.20                                       | 109.76                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 565.00                              | -0.00                              | 418.90              | 1.49                          | 144.30               | 3.50                | 11.80                    | 15.30                    | -0.00     | -0.00 | -0.00        |
| 0                                | 710.00                              | -0.00                              | 419.50              | 2.03                          | 55.60                | 11.30               | 13.70                    | 25.00                    | -0.00     | -0.00 | -0.00        |
| 0                                | 850.00                              | -0.00                              | 389.10              | 2.49                          | 18.20                | 20.20               | 13.30                    | 33.50                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1000.00                             | -0.00                              | 327.80              | 3.00                          | 4.40                 | 30.30               | 11.50                    | 41.90                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1170.00                             | -0.00                              | 266.90              | 3.66                          | 4.50                 | 43.60               | 8.50                     | 52.10                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 53.68                              | 10.57                              | -0.00                               | 3010.00                             | -0.00                              | 3.21                                | 5.79                    | 1.14                    | -0.00                    | 324.78                   | -0.00                   | 0.35                     |
| 0                                | 39.80                              | 3.01                               | -0.00                               | 3030.00                             | -0.00                              | 3.90                                | 5.54                    | 0.42                    | -0.00                    | 421.78                   | -0.00                   | 0.54                     |
| 0                                | 30.26                              | 0.81                               | -0.00                               | 3040.00                             | -0.00                              | 4.28                                | 4.97                    | 0.13                    | -0.00                    | 499.17                   | -0.00                   | 0.79                     |
| 0                                | 21.10                              | 0.16                               | -0.00                               | 3040.00                             | -0.00                              | 4.43                                | 3.89                    | 0.03                    | -0.00                    | 560.88                   | -0.00                   | 0.82                     |
| 0                                | 14.05                              | 0.14                               | -0.00                               | 3030.00                             | -0.00                              | 4.51                                | 3.04                    | 0.03                    | -0.00                    | 655.09                   | -0.00                   | 0.97                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | THC<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>X<br>LB/IK HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|   |        |          |       |        |        |       |
|---|--------|----------|-------|--------|--------|-------|
| 0 | 99.216 | 7553.566 | 7.514 | -0.000 | -0.000 | 9.715 |
| 0 | 57.823 | 5809.855 | 1.548 | -0.000 | -0.000 | 8.189 |
| 0 | 36.387 | 5242.527 | 0.279 | -0.000 | -0.000 | 7.436 |
| 0 | 26.562 | 5729.234 | 0.257 | -0.000 | -0.000 | 8.522 |

DATE: 5/18/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 76 ENGINE TYPE AND MODEL: GTC85-90 SERIAL NUMBER: P-5786

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 28.79 FINISH 28.79

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0026

RELATIVE HUMIDITY: 16.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

NO SHP DATA  
PROBE LOCATIONS 11-20

| TEST<br>MODE | SHAFT<br>HP | POWER     |          | ENGINE<br>SPEED<br>RPM |        | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-----------|----------|------------------------|--------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             | AIR<br>HP |          | N1                     | N2     |                                    |                               |                                  |                                          |                                             |                         |
|              |             |           |          |                        |        |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0       | 41200.00 | -0.00                  | 107.90 | -0.00                              | 0.007100                      | 84.00                            | 51.70                                    |                                             | 0.0                     |
| 2/ 1         | 0.0         | 57.68     | 41100.00 | -0.00                  | 137.10 | -0.00                              | 0.009700                      | 86.00                            | 50.00                                    |                                             | 44.52                   |
| 3/ 2         | 0.0         | 86.06     | 40900.00 | -0.00                  | 162.10 | -0.00                              | 0.011900                      | 87.00                            | 48.30                                    |                                             | 68.59                   |
| 4/ 3         | 0.0         | 109.02    | 40800.00 | -0.00                  | 185.50 | -0.00                              | 0.014300                      | 90.00                            | 46.80                                    |                                             | 89.19                   |
| 5/ 4         | 0.0         | 111.35    | 40700.00 | -0.00                  | 211.00 | -0.00                              | 0.016600                      | 92.00                            | 39.70                                    |                                             | 108.44                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|--|--|--|--|--|--|--|--|--|--|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |  |  |  |
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |  |  |  |
| 0                                | 565.00                              | -0.00                              | 405.70              | 1.40                          | 157.70               | 7.00                | 9.00                     | 16.00                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 710.00                              | -0.00                              | 398.50              | 1.96                          | 55.30                | 17.20               | 8.90                     | 26.10                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 850.00                              | -0.00                              | 364.00              | 2.41                          | 16.60                | 27.30               | 7.90                     | 35.10                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 1000.00                             | -0.00                              | 290.10              | 2.92                          | 4.80                 | 37.30               | 5.90                     | 43.20                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 1170.00                             | -0.00                              | 231.80              | 3.38                          | 2.60                 | 44.20               | 6.30                     | 50.50                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 0                                | 55.20                              | 12.26                              | -0.00                               | 3000.00                             | -0.00                              | 3.57                                | 5.96                    | 1.32                    | -0.00                    | 323.70                   | -0.00                   | 0.38                     |
| 0                                | 19.32                              | 3.12                               | -0.00                               | 3040.00                             | -0.00                              | 4.73                                | 5.39                    | 0.43                    | -0.00                    | 416.78                   | -0.00                   | 0.58                     |
| 0                                | 29.23                              | 0.76                               | -0.00                               | 3040.00                             | -0.00                              | 4.64                                | 4.74                    | 0.12                    | -0.00                    | 492.78                   | -0.00                   | 0.75                     |
| 0                                | 19.28                              | 0.18                               | -0.00                               | 3040.00                             | -0.00                              | 4.71                                | 3.58                    | 0.03                    | -0.00                    | 563.92                   | -0.00                   | 0.87                     |
| 0                                | 13.26                              | 0.08                               | -0.00                               | 3040.00                             | -0.00                              | 4.75                                | 2.80                    | 0.02                    | -0.00                    | 641.44                   | -0.00                   | 1.00                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |  |  |  |  |  |  |
|----------------------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|--|--|--|--|--|--|
|                                              |                      |                           |                       |                      |                           |                           |  |  |  |  |  |  |
|                                              |                      |                           |                       |                      |                           |                           |  |  |  |  |  |  |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |                      |                           |                       |                      |                           |                           |  |  |  |  |  |  |
| 0                                            | 93.469               | 7225.906                  | 7.411                 | -0.000               | -0.000                    | 10.059                    |  |  |  |  |  |  |
| 0                                            | 55.056               | 5725.965                  | 1.433                 | -0.000               | -0.000                    | 8.732                     |  |  |  |  |  |  |
| 0                                            | 32.814               | 5172.656                  | 0.311                 | -0.000               | -0.000                    | 8.023                     |  |  |  |  |  |  |
| 0                                            | 25.126               | 5760.457                  | 0.161                 | -0.000               | -0.000                    | 8.995                     |  |  |  |  |  |  |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 59 ENGINE TYPE AND MODEL: GTC85-90-2 SERIAL NUMBER: P-34276A

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAM REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 108.00 FINISH 108.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

NO SHP DATA

PROBE LOCATIONS 1-10

| TEST MODE | SHAFT HP | POWER AIR HP | ENGINE SPEED RPM | N1    | N2    | CORRECTED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | F/A CALC FROM EMISSIONS | COMPRESSOR INLET TEMP DEGREES F | COMPRESSOR DISCHARGE PRESSURE PSIA | BLEED FLOW LB/MIN |
|-----------|----------|--------------|------------------|-------|-------|---------------------------|-------------------------|-------------------------|---------------------------------|------------------------------------|-------------------|
| 1/ 0      | 0.0      | 0.0          | 41200.00         | -0.00 | -0.00 | -0.00                     | 28.00                   | 0.007300                | 109.00                          | -0.00                              | 0.0               |
| 2/ 1      | 0.0      | 47.65        | 41100.00         | -0.00 | -0.00 | -0.00                     | -0.00                   | 0.009600                | 107.00                          | 49.20                              | 35.98             |
| 3/ 2      | 0.0      | 80.90        | 40800.00         | -0.00 | -0.00 | -0.00                     | -0.00                   | 0.011900                | 108.00                          | 47.30                              | 63.40             |
| 4/ 3      | 0.0      | 106.25       | 40700.00         | -0.00 | -0.00 | -0.00                     | -0.00                   | 0.014500                | 108.00                          | 45.80                              | 86.05             |
| 5/ 4      | 0.0      | 70.88        | 40500.00         | -0.00 | -0.00 | -0.00                     | -0.00                   | 0.016800                | 108.00                          | 29.30                              | 101.07            |

| POWER PERCENT RATED SHP | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                       | 602.00                     | -0.00                     | 381.60        | 1.47                 | 22.70          | 8.40          | 8.10            | 16.50           | -0.00     | -0.00 | -0.00        |
| 0                       | 745.00                     | -0.00                     | 461.10        | 1.93                 | 11.10          | 12.70         | 11.20           | 23.90           | -0.00     | -0.00 | -0.00        |
| 0                       | 900.00                     | -0.00                     | 494.60        | 2.38                 | 4.50           | 17.30         | 11.90           | 29.20           | -0.00     | -0.00 | -0.00        |
| 0                       | 1052.00                    | -0.00                     | 438.80        | 2.93                 | 0.60           | 25.20         | 11.50           | 36.70           | -0.00     | -0.00 | -0.00        |
| 0                       | 1170.00                    | -0.00                     | 385.50        | 3.38                 | 0.50           | 34.00         | 9.40            | 43.40           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED SHP | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|-------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                       | 49.93                     | 1.69                      | -0.00                      | 3020.00                    | -0.00                     | 3.54                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 0                       | 45.83                     | 0.63                      | -0.00                      | 3020.00                    | -0.00                     | 3.90                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 0                       | 39.83                     | 0.21                      | -0.00                      | 3020.00                    | -0.00                     | 3.86                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 0                       | 28.77                     | 0.02                      | -0.00                      | 3020.00                    | -0.00                     | 3.95                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 0                       | 21.88                     | 0.01                      | -0.00                      | 3010.00                    | -0.00                     | 4.05                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |

| POWER PERCENT RATED SHP | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|-------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|   |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|
| 0 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| 0 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| 0 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| 0 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 77 ENGINE TYPE AND MODEL: GTC85-90-2 SERIAL NUMBER: P-342768

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 108.00 FINISH 108.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

NO SHP DATA  
PROBE LOCATIONS 11-20

| TEST<br>MODE | SHAFT<br>HP | POWER  | AIR<br>HP | ENGINE<br>SPEED<br>RPM |        | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------|-----------|------------------------|--------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |        |           | N1                     | N2     |                                    |                               |                                  |                                          |                                             |                         |
|              |             |        |           |                        |        |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0    | 41300.00  | -0.00                  | 101.00 | -0.00                              | 0.007300                      | 107.00                           | -0.00                                    | 0.0                                         |                         |
| 2/ 1         | 0.0         | 48.10  | 41100.00  | -0.00                  | 127.00 | -0.00                              | 0.009500                      | 108.00                           | 49.20                                    | 34.25                                       |                         |
| 3/ 2         | 0.0         | 81.69  | 40800.00  | -0.00                  | 157.00 | -0.00                              | 0.011900                      | 109.00                           | 47.50                                    | 63.64                                       |                         |
| 4/ 3         | 0.0         | 107.09 | 40600.00  | -0.00                  | 179.00 | -0.00                              | 0.014800                      | 108.00                           | 46.00                                    | 84.34                                       |                         |
| 5/ 4         | 0.0         | 70.98  | 40500.00  | -0.00                  | 198.00 | -0.00                              | 0.017100                      | 108.00                           | 29.30                                    | 101.21                                      |                         |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGRFES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |  |  |  |  |  |  |  |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|--|--|--|--|--|--|--|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |
| 0                                | 602.00                              | -0.00                              | 398.50              | 1.47                          | 27.00                | 13.60               | 4.50                     | 18.10                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |
| 0                                | 750.00                              | -0.00                              | 457.90              | 1.90                          | 15.30                | 17.80               | 5.40                     | 23.20                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |
| 0                                | 900.00                              | -0.00                              | 500.30              | 2.39                          | 8.60                 | 25.30               | 4.30                     | 29.60                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |
| 0                                | 1050.00                             | -0.00                              | 448.50              | 2.99                          | 1.80                 | 34.10               | 2.60                     | 36.70                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |
| 0                                | 1167.00                             | -0.00                              | 381.60              | 3.45                          | 0.80                 | 39.80               | 3.60                     | 43.50                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 0                                | 52.35                              | 2.02                               | -0.00                               | 3020.00                             | -0.00                              | 3.90                                | 5.29                    | 0.20                    | -0.00                    | 305.02                   | -0.00                   | 0.39                     |
| 0                                | 46.23                              | 0.88                               | -0.00                               | 3020.00                             | -0.00                              | 3.85                                | 5.87                    | 0.11                    | -0.00                    | 393.54                   | -0.00                   | 0.49                     |
| 0                                | 40.12                              | 0.39                               | -0.00                               | 3010.00                             | -0.00                              | 3.90                                | 6.30                    | 0.06                    | -0.00                    | 472.57                   | -0.00                   | 0.61                     |
| 0                                | 28.81                              | 0.07                               | -0.00                               | 3010.00                             | -0.00                              | 3.88                                | 5.16                    | 0.01                    | -0.00                    | 538.79                   | -0.00                   | 0.69                     |
| 0                                | 21.21                              | 0.02                               | -0.00                               | 3010.00                             | -0.00                              | 3.97                                | 4.20                    | 0.00                    | -0.00                    | 595.98                   | -0.00                   | 0.79                     |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO      |       | CO<br>2  |       | THC   | NO     | NO<br>2 | NO<br>X |
|----------------------------------------------|---------|-------|----------|-------|-------|--------|---------|---------|
|                                              | LB/1K   | HP-HR | LB/1K    | HP-HR |       |        |         |         |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |         |       |          |       |       |        |         |         |
| 0                                            | 122.077 |       | 7974.418 |       | 2.337 | -0.000 | -0.000  | 10.158  |
| 0                                            | 77.105  |       | 5784.902 |       | 0.757 | -0.000 | -0.000  | 7.492   |
| 0                                            | 48.161  |       | 5031.230 |       | 0.112 | -0.000 | -0.000  | 6.477   |
| 0                                            | 59.175  |       | 8397.004 |       | 0.070 | -0.000 | -0.000  | 11.072  |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 78 ENGINE TYPE AND MODEL: GTC85-90-2 SERIAL NUMBER: P-24376C

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 105.00 FINISH 105.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

NO SHP DATA  
12 POINT FIXED PROBE

| TEST<br>MODE | SHAFT<br>HP | POWER<br>HP | AIR<br>HP | ENGINE<br>SPEED<br>RPM | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------------|-----------|------------------------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |             |           | N1                     | N2                                 |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0         | 41300.00  | -0.00                  | 101.50                             | -0.00                         | 0.007200                         | 104.00                                   | 51.10                                       | 0.0                     |
| 2/ 1         | 0.0         | 47.60       | 41100.00  | -0.00                  | 127.00                             | -0.00                         | 0.009400                         | 106.00                                   | 49.40                                       | 35.86                   |
| 3/ 2         | 0.0         | 80.37       | 40900.00  | -0.00                  | 155.00                             | -0.00                         | 0.011800                         | 105.00                                   | 48.00                                       | 62.40                   |
| 4/ 3         | 0.0         | 104.33      | 40700.00  | -0.00                  | 179.00                             | -0.00                         | 0.014200                         | 105.00                                   | 46.50                                       | 83.63                   |
| 5/ 4         | 0.0         | 114.45      | 40500.00  | -0.00                  | 198.00                             | -0.00                         | 0.016700                         | 105.00                                   | 43.60                                       | 98.12                   |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                | 605.00                              | -0.00                              | 384.00              | 1.45                          | 30.00                | 10.60               | 6.00                     | 16.60                    | -0.00     | -0.00 | -0.00        |
| 0                                | 742.00                              | -0.00                              | 462.30              | 1.89                          | 18.00                | 17.60               | 4.80                     | 22.50                    | -0.00     | -0.00 | -0.00        |
| 0                                | 900.00                              | -0.00                              | 488.90              | 2.38                          | 12.80                | 18.10               | 10.10                    | 28.20                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1045.00                             | -0.00                              | 451.60              | 2.87                          | 5.60                 | 25.20               | -0.00                    | 35.00                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1156.00                             | -0.00                              | 405.40              | 3.37                          | 5.60                 | 30.90               | 8.90                     | 39.80                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                | 51.00                              | 2.29                               | -0.00                               | 3030.00                             | -0.00                              | 3.63                                | 5.18                    | 0.23                    | -0.00                    | 307.54                   | -0.00                   | 0.37                     |
| 0                                | 46.90                              | 1.05                               | -0.00                               | 3020.00                             | -0.00                              | 3.74                                | 5.96                    | 0.13                    | -0.00                    | 383.54                   | -0.00                   | 0.48                     |
| 0                                | 39.47                              | 0.99                               | -0.00                               | 3010.00                             | -0.00                              | 3.74                                | 6.12                    | 0.09                    | -0.00                    | 466.55                   | -0.00                   | 0.58                     |
| 0                                | 30.24                              | 0.21                               | -0.00                               | 3010.00                             | -0.00                              | 3.88                                | 5.41                    | 0.04                    | -0.00                    | 538.79                   | -0.00                   | 0.69                     |
| 0                                | 23.05                              | 0.18                               | -0.00                               | 3010.00                             | -0.00                              | 3.72                                | 4.56                    | 0.04                    | -0.00                    | 595.99                   | -0.00                   | 0.74                     |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

|   |         |          |       |        |        |       |
|---|---------|----------|-------|--------|--------|-------|
| 0 | 125.147 | 8057.625 | 2.801 | -0.000 | -0.000 | 9.992 |
| 0 | 76.129  | 5804.875 | 1.144 | -0.000 | -0.000 | 7.217 |
| 0 | 51.885  | 5164.426 | 0.367 | -0.000 | -0.000 | 6.657 |
| 0 | 39.874  | 5207.453 | 0.315 | -0.000 | -0.000 | 6.431 |

DATE: 6/16/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 79 ENGINE TYPE AND MODEL: GTC85-90-2 SERIAL NUMBER: P-243760

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 108.00 FINISH 108.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.70

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0046

RELATIVE HUMIDITY: 9.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

NO SHP  
12 POINT MOVABLE PROBE(AVERAGE OF LOCATIONS 1-20)  
EMISSION RATES NOT CALCULATED BY TEST ORGANIZATION

| TEST<br>MODE | SHAFT<br>HP | POWER | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|-------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |       |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
|              |             |       |           |                        |       |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         |       | 0.0       | 41300.00               | -0.00 | 101.00                             | -0.00                         | 0.007300                         | 107.00                                   | 14.10                                       | 0.0                     |
| 2/ 1         | 0.0         |       | 48.10     | 41100.00               | -0.00 | 127.00                             | -0.00                         | 0.009500                         | 108.00                                   | 49.20                                       | 36.25                   |
| 3/ 2         | 0.0         |       | 81.69     | 40800.00               | -0.00 | 157.00                             | -0.00                         | 0.011900                         | 109.00                                   | 47.50                                       | 63.64                   |
| 4/ 3         | 0.0         |       | 107.09    | 40600.00               | -0.00 | 179.00                             | -0.00                         | 0.014800                         | 108.00                                   | 46.00                                       | 86.34                   |
| 5/ 4         | 0.0         |       | 70.98     | 40500.00               | -0.00 | 198.00                             | -0.00                         | 0.017100                         | 108.00                                   | 29.30                                       | 101.21                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|--|--|--|--|--|--|--|--|--|--|
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |  |  |  |
|                                  |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |  |  |  |  |  |  |  |  |  |  |
| 0                                | 602.00                              | -0.00                              | 390.00              | 1.47                          | 24.80                | 11.00               | 6.30                     | 17.30                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 750.00                              | -0.00                              | 459.50              | 1.91                          | 13.50                | 15.30               | 8.30                     | 23.50                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 900.00                              | -0.00                              | 497.50              | 2.39                          | 6.50                 | 21.30               | 8.10                     | 29.40                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 1050.00                             | -0.00                              | 443.70              | 2.96                          | 1.20                 | 29.70               | 6.60                     | 36.70                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |
| 0                                | 1167.00                             | -0.00                              | 393.50              | 3.42                          | 0.65                 | 36.90               | 6.50                     | 43.40                    | -0.00     | -0.00 | -0.00        |  |  |  |  |  |  |  |  |  |  |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--|--|--|--|--|--|--|--|--|--|--|
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |  |  |  |  |  |  |  |  |  |  |  |
|                                  |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |  |  |  |  |  |  |  |  |  |  |  |
| 0                                | -0.00                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |  |  |  |  |  |  |  |  |  |  |  |
| 0                                | -0.00                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |  |  |  |  |  |  |  |  |  |  |  |
| 0                                | -0.00                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |  |  |  |  |  |  |  |  |  |  |  |
| 0                                | -0.00                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |  |  |  |  |  |  |  |  |  |  |  |
| 0                                | -0.00                              | -0.00                              | -0.00                               | -0.00                               | -0.00                              | -0.00                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |  |  |  |  |  |  |  |  |  |  |  |

| POWER<br>PERCENT<br>RATED<br>SHP | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>X<br>LB/1K HP-HR |  |  |  |  |  |  |
|----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|--|--|--|--|--|--|
|                                  |                   |                        |                    |                   |                        |                        |  |  |  |  |  |  |
|                                  |                   |                        |                    |                   |                        |                        |  |  |  |  |  |  |
| 0                                | -0.000            | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |  |  |  |  |  |  |
| 0                                | -0.000            | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |  |  |  |  |  |  |
| 0                                | -0.000            | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |  |  |  |  |  |  |
| 0                                | -0.000            | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |  |  |  |  |  |  |

\*\*\*\*\*HORSEPOWER-HR BASIS NOT CALCULABLE\*\*\*\*\*

DATE: 5/ 5/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 58 ENGINE TYPE AND MODEL: GTC85-90-2 SERIAL NUMBER: P-24504

RATED SHAFT HORSEPOWER: 0.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.990

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 28.54 FINISH 0.0

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0042

RELATIVE HUMIDITY: 23.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

| TEST<br>MODE | SHAFT<br>HP | POWER  | AIR<br>HP | ENGINE<br>SPEED<br>RPM |       | CORRECTED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | F/A<br>CALC<br>FROM<br>EMISSIONS | COMPRESSOR<br>INLET<br>TEMP<br>DEGREES F | COMPRESSOR<br>DISCHARGE<br>PRESSURE<br>PSIA | BLEED<br>FLOW<br>LB/MIN |
|--------------|-------------|--------|-----------|------------------------|-------|------------------------------------|-------------------------------|----------------------------------|------------------------------------------|---------------------------------------------|-------------------------|
|              |             |        |           | N1                     | N2    |                                    |                               |                                  |                                          |                                             |                         |
| 1/ 0         | 0.0         | 0.0    | 0.0       | 40850.00               | -0.00 | -0.00                              | -0.00                         | 0.006500                         | 77.00                                    | 53.50                                       | 0.0                     |
| 2/ 1         | 0.0         | 42.31  | 40760.00  | -0.00                  | -0.00 | -0.00                              | -0.00                         | 0.008800                         | 76.00                                    | 52.50                                       | 31.76                   |
| 3/ 2         | 0.0         | 82.57  | 40660.00  | -0.00                  | -0.00 | -0.00                              | -0.00                         | 0.010900                         | 91.00                                    | 51.20                                       | 62.87                   |
| 4/ 3         | 0.0         | 107.97 | 40580.00  | -0.00                  | -0.00 | -0.00                              | -0.00                         | 0.013400                         | 82.00                                    | 50.00                                       | 83.95                   |
| 5/ 4         | 0.0         | 127.37 | 40450.00  | -0.00                  | -0.00 | -0.00                              | -0.00                         | 0.017000                         | 77.00                                    | 49.30                                       | 101.34                  |

| POWER<br>PERCENT<br>RATED<br>SHP | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV |                      | TMC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|----------------------------------|-------------------------------------|------------------------------------|---------------------|----------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                  |                                     |                                    | CO                  | CO<br>2<br>PERCENT V |                      |                     |                          |                          |           |       |              |
| 0                                | 545.00                              | -0.00                              | 341.50              | 1.30                 | 58.00                | 3.10                | 12.90                    | 16.10                    | -0.00     | -0.00 | -0.00        |
| 0                                | 675.00                              | -0.00                              | 429.90              | 1.75                 | 46.80                | 6.20                | 14.30                    | 20.60                    | -0.00     | -0.00 | -0.00        |
| 0                                | 825.00                              | -0.00                              | 501.90              | 2.17                 | 36.90                | 12.70               | 15.30                    | 27.90                    | -0.00     | -0.00 | -0.00        |
| 0                                | 975.00                              | -0.00                              | 498.00              | 2.68                 | 24.50                | 20.70               | 13.70                    | 34.40                    | -0.00     | -0.00 | -0.00        |
| 0                                | 1125.00                             | -0.00                              | 419.50              | 3.41                 | 6.30                 | 30.60               | 12.60                    | 43.20                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>SHP | MASS EMI<br>CO<br>LB/1K<br>LB FUEL |      | MASS EMI<br>HC<br>LB/1K<br>LB FUEL |         | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL |      | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL |       | MASS EMI<br>NO<br>LB/1K<br>LB FUEL |       | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL |       |
|----------------------------------|------------------------------------|------|------------------------------------|---------|-------------------------------------|------|-------------------------------------|-------|------------------------------------|-------|-------------------------------------|-------|
|                                  | CO                                 | HC   | NO2                                | CO2     | NO                                  | NOX  | CO                                  | HC    | NO2                                | CO2   | NO                                  | NOX   |
| 0                                | 50.12                              | 4.86 | -0.00                              | 3010.00 | -0.00                               | 3.87 | -0.00                               | -0.00 | -0.00                              | -0.00 | -0.00                               | -0.00 |
| 0                                | 46.89                              | 2.92 | -0.00                              | 3000.00 | -0.00                               | 1.69 | -0.00                               | -0.00 | -0.00                              | -0.00 | -0.00                               | -0.00 |
| 0                                | 43.99                              | 1.85 | -0.00                              | 2990.00 | -0.00                               | 4.02 | -0.00                               | -0.00 | -0.00                              | -0.00 | -0.00                               | -0.00 |
| 0                                | 35.39                              | 0.99 | -0.00                              | 2990.00 | -0.00                               | 4.02 | -0.00                               | -0.00 | -0.00                              | -0.00 | -0.00                               | -0.00 |
| 0                                | 23.42                              | 0.20 | -0.00                              | 2990.00 | -0.00                               | 3.96 | -0.00                               | -0.00 | -0.00                              | -0.00 | -0.00                               | -0.00 |

| POWER<br>PERCENT<br>RATED<br>SHP             | CO     |       | CO<br>2 |       | TMC    |       | NO     |       | NO<br>2 |       | NO<br>X |       |
|----------------------------------------------|--------|-------|---------|-------|--------|-------|--------|-------|---------|-------|---------|-------|
|                                              | LB/1K  | HP-HR | LB/1K   | HP-HR | LB/1K  | HP-HR | LB/1K  | HP-HR | LB/1K   | HP-HR | LB/1K   | HP-HR |
| *****HORSEPOWER-HR BASIS NOT CALCULABLE***** |        |       |         |       |        |       |        |       |         |       |         |       |
| 0                                            | -0.000 |       | -0.000  |       | -0.000 |       | -0.000 |       | -0.000  |       | -0.000  |       |
| 0                                            | -0.000 |       | -0.000  |       | -0.000 |       | -0.000 |       | -0.000  |       | -0.000  |       |
| 0                                            | -0.000 |       | -0.000  |       | -0.000 |       | -0.000 |       | -0.000  |       | -0.000  |       |
| 0                                            | -0.000 |       | -0.000  |       | -0.000 |       | -0.000 |       | -0.000  |       | -0.000  |       |

**TABLE IV**

**TURBINE/TURBOPROP ENGINES  
(UNWEIGHTED PROCESSING)**

**CONTENTS:**

|                         |                                                                    |
|-------------------------|--------------------------------------------------------------------|
| <b>IV-2 TO IV-299</b>   | <b>INDIVIDUAL ENGINE RUNS – COMPLETELY PROCESSED</b>               |
| <b>IV-300 TO IV-312</b> | <b>MODEL SUMMARIES</b>                                             |
| <b>IV-313 TO IV-361</b> | <b>INDIVIDUAL ENGINE RUNS – MASS EMISSION<br/>CONVERSIONS ONLY</b> |
| <b>IV-362</b>           | <b>INDIVIDUAL RUN – INPUT DATA REPRODUCED ONLY</b>                 |

DATE: 6/18/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 2 ENGINE TYPE AND MODEL: T50-A7B SERIAL NUMBER: AF-109141

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 5114. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 29.26 FINISH 29.26

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0214

RELATIVE HUMIDITY: 63.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| FLASPED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | N1    | N2    | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-------|-------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 2325.00                           | 61                       | 13800.00               | -0.00 | -0.00 | 1465.00                           | 30.80                         | 0.013200    | -0.00                                        | -0.00                              | 1505.00                               |
| 5.30            | 2/ 1         | 1202.00                           | 85                       | 13800.00               | -0.00 | -0.00 | 1810.00                           | 30.80                         | 0.016300    | -0.00                                        | -0.00                              | 1710.00                               |
| 11.00           | 3/ 2         | 3553.00                           | 94                       | 13800.00               | -0.00 | -0.00 | 1945.00                           | 30.80                         | 0.017500    | -0.00                                        | -0.00                              | 1780.00                               |
| 16.30           | 4/ 3         | 465.00                            | 23                       | 13100.00               | -0.00 | -0.00 | 910.00                            | 28.70                         | 0.009800    | -0.00                                        | -0.00                              | 1168.00                               |
| 19.30           | 5/ 4         | 3684.00                           | 98                       | 14200.00               | -0.00 | -0.00 | 1980.00                           | 32.60                         | 0.016800    | -0.00                                        | -0.00                              | 1900.00                               |
| 21.30           | 4/ 5         | 865.00                            | 23                       | 13100.00               | -0.00 | -0.00 | 905.00                            | 28.70                         | 0.008800    | -0.00                                        | -0.00                              | 1170.00                               |
| 24.00           | 8/ 4         | 277.00                            | 7                        | 13430.00               | -0.00 | -0.00 | 715.00                            | 29.20                         | 0.006800    | -0.00                                        | -0.00                              | 1046.00                               |
| 26.30           | 7/ 8         | 119.00                            | 3                        | 9980.00                | -0.00 | -0.00 | 555.00                            | 15.00                         | 0.010300    | -0.00                                        | -0.00                              | 1128.00                               |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | H2C<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>x<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 61                                | -0.00                               | -0.00                              | 28.00               | 2.37                          | 0.0                  | -0.00               | -0.00                    | 68.00                    | -0.00     | -0.00 | -0.00        |
| 85                                | -0.00                               | -0.00                              | 26.00               | 3.08                          | 0.0                  | -0.00               | -0.00                    | 96.00                    | -0.00     | -0.00 | -0.00        |
| 94                                | -0.00                               | -0.00                              | 24.00               | 3.78                          | 0.0                  | -0.00               | -0.00                    | 102.00                   | -0.00     | -0.00 | -0.00        |
| 23                                | -0.00                               | -0.00                              | 27.00               | 1.66                          | 0.0                  | -0.00               | -0.00                    | 32.00                    | -0.00     | -0.00 | -0.00        |
| 98                                | -0.00                               | -0.00                              | 23.00               | 3.54                          | 0.0                  | -0.00               | -0.00                    | 102.00                   | -0.00     | -0.00 | -0.00        |
| 23                                | -0.00                               | -0.00                              | 30.00               | 1.64                          | 5.00                 | -0.00               | -0.00                    | 32.00                    | -0.00     | -0.00 | -0.00        |
| 7                                 | -0.00                               | -0.00                              | 27.00               | 1.32                          | 2.00                 | -0.00               | -0.00                    | 74.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | -0.00                               | -0.00                              | 271.00              | 2.07                          | 275.00               | -0.00               | -0.00                    | 25.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 61                                | 2.36                               | 0.0                                | -0.00                               | 3135.17                             | -0.00                              | 9.40                                | 3.45                    | 0.0                     | -0.00                    | 4593.02                  | -0.00                   | 13.78                    |
| 85                                | 1.68                               | 0.0                                | -0.00                               | 3176.22                             | -0.00                              | 10.22                               | 3.05                    | 0.0                     | -0.00                    | 5676.56                  | -0.00                   | 18.50                    |
| 94                                | 1.46                               | 0.0                                | -0.00                               | 3136.58                             | -0.00                              | 10.70                               | 2.84                    | 0.0                     | -0.00                    | 6100.64                  | -0.00                   | 19.83                    |
| 23                                | 3.24                               | 0.0                                | -0.00                               | 3133.77                             | -0.00                              | 6.32                                | 2.95                    | 0.0                     | -0.00                    | 2851.73                  | -0.00                   | 5.75                     |
| 98                                | 1.30                               | 0.0                                | -0.00                               | 3136.83                             | -0.00                              | 9.45                                | 2.57                    | 0.0                     | -0.00                    | 6210.93                  | -0.00                   | 18.71                    |
| 23                                | 3.65                               | 0.35                               | -0.00                               | 3132.19                             | -0.00                              | 6.39                                | 3.30                    | 0.32                    | -0.00                    | 2834.63                  | -0.00                   | 5.78                     |
| 7                                 | 4.08                               | 0.17                               | -0.00                               | 3131.99                             | -0.00                              | 5.95                                | 2.92                    | 0.12                    | -0.00                    | 2239.17                  | -0.00                   | 4.26                     |
| 3                                 | 25.54                              | 12.15                              | -0.00                               | 3065.42                             | -0.00                              | 3.87                                | 14.18                   | 6.74                    | -0.00                    | 1701.31                  | -0.00                   | 2.15                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/IK HP-HR | CO<br>2<br>LB/IK HP-HR | H2C<br>LB/IK HP-HR | NO<br>LB/IK HP-HR | NO<br>2<br>LB/IK HP-HR | NO<br>x<br>LB/IK HP-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 61                                | 1.485             | 1975.491               | 0.0                | -0.000            | -0.000                 | 5.925                  |
| 85                                | 0.752             | 1772.818               | 0.0                | -0.000            | -0.000                 | 5.777                  |
| 94                                | 0.500             | 1717.039               | 0.0                | -0.000            | -0.000                 | 5.582                  |
| 23                                | 3.413             | 3296.804               | 0.0                | -0.000            | -0.000                 | 6.644                  |
| 98                                | 0.597             | 1685.919               | 0.0                | -0.000            | -0.000                 | 5.078                  |
| 23                                | 3.815             | 3277.030               | 0.364              | -0.000            | -0.000                 | 6.685                  |
| 7                                 | 10.524            | 8094.383               | 0.446              | -0.000            | -0.000                 | 15.366                 |
| 3                                 | 119.123           | 14296.711              | 56.644             | -0.000            | -0.000                 | 18.050                 |

CAL ID NUMBER: 2 ENGINE TYPE AND MODEL: T56-A7B

SERIAL NUMBER: AE-103141

TEST ORGANIZATION: S W R I KELLY

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 20.906                    | 575.503               | 1.000              | 19.00                   | 6.620              | 182.24               | 36.326                | 35.67           | 0.18558          |
| TAKEOFF   | 1.000               | 3755.0      | 2.500                     | 2032.360              | 1.000              | 0.50                    | 0.021              | 16.94                | 1.230                 | 31.29           | 0.00067          |
| CLIMBOUT  | 0.900               | 3379.5      | 2.814                     | 1891.839              | 1.000              | 2.50                    | 0.117              | 78.83                | 1.487                 | 140.81          | 0.00083          |
| APPROACH  | 0.300               | 1126.5      | 3.458                     | 1071.003              | 1.000              | 4.50                    | 0.259              | 80.33                | 3.229                 | 84.49           | 0.00307          |
| TAXI-IDLE | 0.030               | 112.6       | 20.906                    | 575.503               | 1.000              | 7.00                    | 2.439              | 67.14                | 36.326                | 13.14           | 0.18558          |

TOTAL FOR CYCLE: 9.456 425.47 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 22.226  
 LBS POLLUTANT/1K HP-HR/CYCLE: 30.964  
 LBS POLLUTANT/1000K HP AT T.O.: 0.555

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 8.487                     | 575.503               | 1.000              | 19.00                   | 2.688              | 182.24               | 14.747                | 35.67           | 0.07534          |
| TAKEOFF   | 1.000               | 3755.0      | 0.059                     | 2032.360              | 1.000              | 0.50                    | 0.000              | 16.94                | 0.029                 | 31.29           | 0.00002          |
| CLIMBOUT  | 0.900               | 3379.5      | 0.065                     | 1891.839              | 1.000              | 2.50                    | 0.003              | 78.83                | 0.035                 | 140.81          | 0.00002          |
| APPROACH  | 0.300               | 1126.5      | 0.081                     | 1071.003              | 1.000              | 4.50                    | 0.006              | 80.33                | 0.075                 | 84.49           | 0.00007          |
| TAXI-IDLE | 0.030               | 112.6       | 8.487                     | 575.503               | 1.000              | 7.00                    | 0.990              | 67.14                | 14.747                | 13.14           | 0.07534          |

TOTAL FOR CYCLE: 3.687 425.47 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 8.665  
 LBS POLLUTANT/1K HP-HR/CYCLE: 12.072  
 LBS POLLUTANT/1000K HP AT T.O.: 0.130

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.084                     | 575.503               | 1.000              | 19.00                   | 0.460               | 182.24               | 3.620                 | 35.67           | 0.01850          |
| TAKEOFF   | 1.000               | 3755.0      | 18.149                    | 2032.360              | 1.000              | 0.50                    | 0.151               | 16.94                | 8.930                 | 31.29           | 0.00483          |
| CLIMBOUT  | 0.900               | 3379.5      | 19.766                    | 1891.839              | 1.000              | 2.50                    | 0.824               | 78.83                | 10.448                | 140.81          | 0.00565          |
| APPROACH  | 0.300               | 1126.5      | 7.283                     | 1071.003              | 1.000              | 4.50                    | 0.546               | 80.33                | 6.800                 | 84.49           | 0.00647          |
| TAXI-IDLE | 0.030               | 112.6       | 2.084                     | 575.503               | 1.000              | 7.00                    | 0.243               | 67.14                | 3.620                 | 13.14           | 0.01850          |

TOTAL FOR CYCLE: 2.424 425.47 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 5.697  
 LBS POLLUTANT/1K HP-HR/CYCLE: 7.937  
 LBS POLLUTANT/1000K HP AT T.O.: 40.278

DATE: 6/18/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA .....

CAL ID NUMBER: 3 ENGINE TYPE AND MODEL: T56-A7R SERIAL NUMBER: AE-104886

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 4865. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL W/C RATIO: 1.995

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 29.27 FINISH 29.27

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0186

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2191.00            | 58                       | 13780.00         | -0.00                    | 1430.00                 | 0.013200 | -0.00                               | -0.00                     | 1506.00                      |
| 4.00         | 2/ 1      | 3070.00            | 81                       | 13800.00         | -0.00                    | 1755.00                 | 0.016200 | -0.00                               | -0.00                     | 1710.00                      |
| 9.00         | 3/ 2      | 1421.00            | 91                       | 13800.00         | -0.00                    | 1885.00                 | 0.017400 | -0.00                               | -0.00                     | 1780.00                      |
| 15.00        | 4/ 3      | 821.00             | 21                       | 13280.00         | -0.00                    | 875.00                  | 0.008700 | -0.00                               | -0.00                     | 1178.00                      |
| 17.00        | 5/ 4      | 3808.00            | 101                      | 14200.00         | -0.00                    | 2055.00                 | 0.018000 | -0.00                               | -0.00                     | 1910.00                      |
| 18.00        | 4/ 5      | 221.00             | 21                       | 13280.00         | -0.00                    | 880.00                  | 0.008700 | -0.00                               | -0.00                     | 1182.00                      |
| 20.00        | 8/ 4      | 299.00             | 7                        | 13440.00         | -0.00                    | 705.00                  | 0.006900 | -0.00                               | -0.00                     | 1062.00                      |
| 22.30        | 7/ 8      | 119.00             | 3                        | 9970.00          | -0.00                    | 565.00                  | 0.010200 | -0.00                               | -0.00                     | 1166.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WFT) PPMV | CO 2 (WFT) PERCENT V | THC (WFT) PPMV | NO (WFT) PPMV | NO 2 (WFT) PPMV | NO X (WFT) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 58                       | -0.00                      | -0.00                     | 40.00         | 2.42                 | 0.0            | -0.00         | -0.00           | 73.00           | -0.00     | -0.00 | -0.00        |
| 81                       | -0.00                      | -0.00                     | 39.00         | 3.07                 | 1.00           | -0.00         | -0.00           | 103.00          | -0.00     | -0.00 | -0.00        |
| 91                       | -0.00                      | -0.00                     | 39.00         | 3.25                 | 1.00           | -0.00         | -0.00           | 33.00           | -0.00     | -0.00 | -0.00        |
| 21                       | -0.00                      | -0.00                     | 45.00         | 1.60                 | 2.00           | -0.00         | -0.00           | 31.00           | -0.00     | -0.00 | -0.00        |
| 101                      | -0.00                      | -0.00                     | 38.00         | 3.48                 | 0.0            | -0.00         | -0.00           | 111.00          | -0.00     | -0.00 | -0.00        |
| 21                       | -0.00                      | -0.00                     | 45.00         | 1.62                 | 2.00           | -0.00         | -0.00           | 33.00           | -0.00     | -0.00 | -0.00        |
| 7                        | -0.00                      | -0.00                     | 45.00         | 1.30                 | 2.00           | -0.00         | -0.00           | 24.00           | -0.00     | -0.00 | -0.00        |
| 3                        | -0.00                      | -0.00                     | 287.00        | 2.05                 | 228.00         | -0.00         | -0.00           | 26.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 58                       | 3.10                      | 0.0                       | -0.00                      | 3133.69                    | -0.00                     | 9.88                       | 4.71              | 0.0               | -0.00              | 4481.18            | -0.00             | 14.13              |
| 81                       | 2.53                      | 0.04                      | -0.00                      | 3134.79                    | -0.00                     | 10.99                      | 4.45              | 0.07              | -0.00              | 5501.55            | -0.00             | 19.30              |
| 91                       | 2.39                      | 0.04                      | -0.00                      | 3135.01                    | -0.00                     | 3.33                       | 4.51              | 0.07              | -0.00              | 5909.50            | -0.00             | 6.27               |
| 21                       | 5.60                      | 0.14                      | -0.00                      | 3124.68                    | -0.00                     | 6.75                       | 4.90              | 0.17              | -0.00              | 2738.47            | -0.00             | 5.90               |
| 101                      | 2.18                      | 0.0                       | -0.00                      | 3135.45                    | -0.00                     | 10.46                      | 4.48              | 0.0               | -0.00              | 6443.34            | -0.00             | 21.49              |
| 21                       | 5.53                      | 0.14                      | -0.00                      | 3124.74                    | -0.00                     | 6.66                       | 4.87              | 0.17              | -0.00              | 2754.22            | -0.00             | 5.87               |
| 7                        | 6.89                      | 0.18                      | -0.00                      | 3127.57                    | -0.00                     | 6.04                       | 4.86              | 0.12              | -0.00              | 2204.94            | -0.00             | 4.26               |
| 3                        | 27.29                     | 12.41                     | -0.00                      | 3061.95                    | -0.00                     | 4.06                       | 15.41             | 7.01              | -0.00              | 1730.00            | -0.00             | 2.29               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 58                       | 2.150          | 2043.400         | 0.0             | -0.000         | -0.000           | 6.444            |
| 81                       | 1.449          | 1792.035         | 0.021           | -0.000         | -0.000           | 6.285            |
| 91                       | 1.319          | 1727.418         | 0.019           | -0.000         | -0.000           | 1.834            |
| 21                       | 5.971          | 3335.530         | 0.152           | -0.000         | -0.000           | 7.192            |
| 101                      | 1.176          | 1692.055         | 0.0             | -0.000         | -0.000           | 5.642            |
| 21                       | 5.931          | 3354.704         | 0.151           | -0.000         | -0.000           | 7.144            |
| 7                        | 16.246         | 7374.167         | 0.414           | -0.000         | -0.000           | 14.232           |
| 3                        | 129.536        | 14517.840        | 58.917          | -0.000         | -0.000           | 19.275           |

CAL ID NUMBER: 3 ENGINE TYPE AND MODEL: T56-A78

SERIAL NUMBER: AE-104886

TEST ORGANIZATION: S W R I KELLY

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 15.642                    | 555.406               | 1.000              | 19.00                   | 4.953              | 175.88               | 28.164                | 35.67           | 0.13886          |
| TAKEOFF   | 1.000               | 3755.0      | 4.254                     | 2038.633              | 1.000              | 0.50                    | 0.035              | 16.99                | 2.087                 | 31.29           | 0.00113          |
| CLIMBOUT  | 0.900               | 3379.5      | 4.416                     | 1891.581              | 1.000              | 2.50                    | 0.184              | 78.82                | 2.335                 | 140.81          | 0.00131          |
| APPROACH  | 0.300               | 1126.5      | 5.229                     | 1053.412              | 1.000              | 4.50                    | 0.392              | 79.01                | 4.964                 | 84.49           | 0.00464          |
| TAXI-IDLE | 0.030               | 112.6       | 15.642                    | 555.406               | 1.000              | 7.00                    | 1.825              | 64.80                | 28.164                | 13.14           | 0.13886          |

TOTAL FOR CYCLE: 7.390 415.49 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 17.787  
 LBS POLLUTANT/1K HP-HR/CYCLE: 24.197  
 LBS POLLUTANT/1000K HP AT T.O.: 0.944

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 7.971                     | 555.406               | 1.000              | 19.00                   | 2.524              | 175.88               | 14.353                | 35.67           | 0.07076          |
| TAKEOFF   | 1.000               | 3755.0      | 0.065                     | 2038.633              | 1.000              | 0.50                    | 0.001              | 16.99                | 0.032                 | 31.29           | 0.00002          |
| CLIMBOUT  | 0.900               | 3379.5      | 0.087                     | 1891.581              | 1.000              | 2.50                    | 0.004              | 78.82                | 0.046                 | 140.81          | 0.00003          |
| APPROACH  | 0.300               | 1126.5      | 0.135                     | 1053.412              | 1.000              | 4.50                    | 0.010              | 79.01                | 0.128                 | 84.49           | 0.00012          |
| TAXI-IDLE | 0.030               | 112.6       | 7.971                     | 555.406               | 1.000              | 7.00                    | 0.930              | 64.80                | 14.353                | 13.14           | 0.07076          |

TOTAL FOR CYCLE: 3.469 415.49 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 8.348  
 LBS POLLUTANT/1K HP-HR/CYCLE: 11.357  
 LBS POLLUTANT/1000K HP AT T.O.: 0.144

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.239                     | 555.406               | 1.000              | 19.00                   | 0.709               | 175.88               | 4.031                 | 35.67           | 0.01987          |
| TAKEOFF   | 1.000               | 3755.0      | 21.551                    | 2038.633              | 1.000              | 0.50                    | 0.180               | 16.99                | 10.571                | 31.29           | 0.00574          |
| CLIMBOUT  | 0.900               | 3379.5      | 20.763                    | 1891.581              | 1.000              | 2.50                    | 0.865               | 78.82                | 10.976                | 140.81          | 0.00614          |
| APPROACH  | 0.300               | 1126.5      | 7.660                     | 1053.412              | 1.000              | 4.50                    | 0.574               | 79.01                | 7.272                 | 84.49           | 0.00680          |
| TAXI-IDLE | 0.030               | 112.6       | 2.239                     | 555.406               | 1.000              | 7.00                    | 0.261               | 64.80                | 4.031                 | 13.14           | 0.01987          |

TOTAL FOR CYCLE: 2.589 415.49 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 6.232  
 LBS POLLUTANT/1K HP-HR/CYCLE: 8.478  
 LBS POLLUTANT/1000K HP AT T.O.: 47.827

DATE: 6/18/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 4 ENGINE TYPE AND MODEL: T56-A7B SERIAL NUMBER: AF-101854  
 RATED HORSEPOWER: 3755.  
 ENGINE TOTAL TIME: 7793. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS  
 FUEL: JP-4 FUEL W/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 81.00  
 ATMOSPHERIC PRESSURE: START 28.90 FINISH 28.90  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0187  
 RELATIVE HUMIDITY: -0.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SFC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2214.00                  | 58                 | 13800.00         | -0.00                    | 1440.00                 | 0.013000 | -0.00                               | -0.00                     | 1510.00                      |
| 10.50        | 2/ 1      | 3092.00                  | 82                 | 13800.00         | -0.00                    | 1770.00                 | 0.016000 | -0.00                               | -0.00                     | 1710.00                      |
| 16.35        | 3/ 2      | 3399.00                  | 90                 | 13800.00         | -0.00                    | 1910.00                 | 0.017200 | -0.00                               | -0.00                     | 1780.00                      |
| 26.20        | 4/ 3      | 823.00                   | 21                 | 13300.00         | -0.00                    | 890.00                  | 0.008600 | -0.00                               | -0.00                     | 1180.00                      |
| 26.05        | 5/ 4      | 3618.00                  | 96                 | 14240.00         | -0.00                    | 2000.00                 | 0.017000 | -0.00                               | -0.00                     | 1890.00                      |
| 26.35        | 6/ 5      | 821.00                   | 21                 | 13270.00         | -0.00                    | 895.00                  | 0.008700 | -0.00                               | -0.00                     | 1180.00                      |
| 27.50        | 7/ 4      | 756.00                   | 6                  | 13450.00         | -0.00                    | 705.00                  | 0.007000 | -0.00                               | -0.00                     | 1052.00                      |
| 30.50        | 7/ 8      | 87.00                    | 2                  | 9940.00          | -0.00                    | 555.00                  | 0.010300 | -0.00                               | -0.00                     | 1155.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 58                       | -0.00                      | -0.00                     | 32.00         | 2.28                 | 0.0            | 61.00         | 5.00            | 66.00           | -0.00     | -0.00 | -0.00        |
| 82                       | -0.00                      | -0.00                     | 28.00         | 2.98                 | 0.0            | 89.00         | 1.00            | 90.00           | -0.00     | -0.00 | -0.00        |
| 90                       | -0.00                      | -0.00                     | 25.00         | 3.21                 | 0.0            | 98.00         | 3.00            | 101.00          | -0.00     | -0.00 | -0.00        |
| 21                       | -0.00                      | -0.00                     | 32.00         | 1.67                 | 0.0            | 0.0           | 0.0             | 31.00           | -0.00     | -0.00 | -0.00        |
| 96                       | -0.00                      | -0.00                     | 26.00         | 3.60                 | 0.0            | 95.00         | 0.0             | 0.0             | -0.00     | -0.00 | -0.00        |
| 21                       | -0.00                      | -0.00                     | 33.00         | 1.67                 | 0.0            | 25.00         | 5.00            | 30.00           | -0.00     | -0.00 | -0.00        |
| 6                        | -0.00                      | -0.00                     | 34.00         | 1.33                 | 0.0            | 18.00         | 4.00            | 22.00           | -0.00     | -0.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 300.00        | 2.08                 | 348.00         | 10.00         | 0.0             | 0.0             | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 58                       | 2.80                      | 0.0                       | 0.72                       | 3134.47                    | 8.77                      | 9.49                       | 4.03              | 0.0               | 1.03               | 4513.64            | 12.62             | 13.66              |
| 82                       | 1.88                      | 0.0                       | 0.11                       | 3135.92                    | 9.79                      | 9.90                       | 3.32              | 0.0               | 0.19               | 5550.58            | 17.33             | 17.52              |
| 90                       | 1.55                      | 0.0                       | 0.31                       | 3136.43                    | 10.01                     | 10.32                      | 2.97              | 0.0               | 0.59               | 5990.58            | 19.12             | 19.70              |
| 21                       | 3.82                      | 0.0                       | 0.0                        | 3132.87                    | 0.0                       | 6.08                       | 3.40              | 0.0               | 0.0                | 2788.25            | 0.0               | 5.41               |
| 96                       | 1.44                      | 0.0                       | 0.0                        | 3136.61                    | 8.65                      | 0.0                        | 2.88              | 0.0               | 0.0                | 6273.21            | 17.31             | 0.0                |
| 21                       | 3.94                      | 0.0                       | 0.98                       | 3132.68                    | 4.90                      | 5.88                       | 1.53              | 0.0               | 0.88               | 2803.75            | 4.39              | 5.27               |
| 6                        | 5.09                      | 0.0                       | 0.98                       | 3130.87                    | 4.43                      | 5.41                       | 3.59              | 0.0               | 0.69               | 2207.26            | 3.12              | 3.82               |
| 2                        | 27.94                     | 18.56                     | 0.0                        | 3044.04                    | 1.53                      | 0.0                        | 15.51             | 10.30             | 0.0                | 1689.44            | 0.85              | 0.0                |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 58                       | 1.821          | 2038.680         | 0.0             | 5.702          | 0.467            | 6.169            |
| 82                       | 1.074          | 1795.143         | 0.0             | 5.605          | 0.063            | 5.668            |
| 90                       | 0.874          | 1762.453         | 0.0             | 5.625          | 0.172            | 5.797            |
| 21                       | 4.132          | 3387.915         | 0.0             | 0.0            | 0.0              | 6.574            |
| 96                       | 0.797          | 1733.889         | 0.0             | 4.783          | 0.0              | 0.0              |
| 21                       | 4.294          | 3415.043         | 0.0             | 5.344          | 1.069            | 6.413            |
| 6                        | 14.028         | 8622.117         | 0.0             | 12.199         | 2.711            | 14.910           |
| 2                        | 178.256        | 19418.879        | 118.426         | 9.760          | 0.0              | 0.0              |

CAL ID NUMBER: 4 ENGINE TYPE AND MODEL: T56-A7B

SERIAL NUMBER: AE-101854

TEST ORGANIZATION: S W R I KELLY

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 12.931                    | 576.902               | 1.000              | 19.00                   | 4.095              | 182.69               | 22.414                | 35.67           | 0.11479          |
| TAKEOFF   | 1.000               | 3755.0      | 2.701                     | 2083.368              | 1.000              | 0.50                    | 0.023              | 17.36                | 1.296                 | 31.29           | 0.00072          |
| CLIMBOUT  | 0.900               | 3379.5      | 3.141                     | 1924.923              | 1.000              | 2.50                    | 0.131              | 80.21                | 1.632                 | 140.81          | 0.00093          |
| APPROACH  | 0.300               | 1126.5      | 3.703                     | 1031.957              | 1.000              | 4.50                    | 0.278              | 77.40                | 3.588                 | 84.49           | 0.00329          |
| TAXI-IDLE | 0.030               | 112.6       | 12.931                    | 576.902               | 1.000              | 7.00                    | 1.509              | 67.31                | 22.414                | 13.14           | 0.11479          |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 6.034  
 LBS POLLUTANT/1K HP-HR/CYCLE: 14.200  
 LBS POLLUTANT/1000K HP AT T.O.: 0.599

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 7.534                     | 576.902               | 1.000              | 19.00                   | 2.386              | 182.69               | 13.060                | 35.67           | 0.06688          |
| TAKEOFF   | 1.000               | 3755.0      | 0.007                     | 2083.368              | 1.000              | 0.50                    | 0.000              | 17.36                | 0.003                 | 31.29           | 0.00000          |
| CLIMBOUT  | 0.900               | 3379.5      | 0.0                       | 1924.923              | 1.000              | 2.50                    | 0.0                | 80.21                | 0.0                   | 140.81          | 0.0              |
| APPROACH  | 0.300               | 1126.5      | 0.0                       | 1031.957              | 1.000              | 4.50                    | 0.0                | 77.40                | 0.0                   | 84.49           | 0.0              |
| TAXI-IDLE | 0.030               | 112.6       | 7.534                     | 576.902               | 1.000              | 7.00                    | 0.879              | 67.31                | 13.060                | 13.14           | 0.06688          |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 3.265  
 LBS POLLUTANT/1K HP-HR/CYCLE: 7.683  
 LBS POLLUTANT/1000K HP AT T.O.: 0.016

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE | 0.030               | 112.6       | 1.474                     | 576.902               | 1.000              | 19.00                   | 0.467               | 182.69               | 2.555                  | 35.67           | 0.01308           |
| TAKEOFF   | 1.000               | 3755.0      | 21.849                    | 2083.368              | 1.000              | 0.50                    | 0.182               | 17.36                | 10.487                 | 31.29           | 0.00582           |
| CLIMBOUT  | 0.900               | 3379.5      | 19.881                    | 1924.923              | 1.000              | 2.50                    | 0.828               | 80.21                | 10.328                 | 140.81          | 0.00588           |
| APPROACH  | 0.300               | 1126.5      | 6.952                     | 1031.957              | 1.000              | 4.50                    | 0.521               | 77.40                | 6.737                  | 84.49           | 0.00617           |
| TAXI-IDLE | 0.030               | 112.6       | 1.474                     | 576.902               | 1.000              | 7.00                    | 0.172               | 67.31                | 2.555                  | 13.14           | 0.01308           |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 2.171  
 LBS POLLUTANT/1K HP-HR/CYCLE: 5.108  
 LBS POLLUTANT/1000K HP AT T.O.: 7.107  
 LBS POLLUTANT/1000K HP AT T.O.: 48.488

DATE: 6/21/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 5 ENGINE TYPE AND MODEL: T56-A7B SERIAL NUMBER: AE-101776  
RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 7751. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.21 FINISH 29.21

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0184

RELATIVE HUMIDITY: 67.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | N1    | N2    | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|-------|-------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2759.00            | 60                       | 13820.00         | -0.00 | -0.00 | 1450.00                  | 30.60                   | 0.013200 | -0.00                               | -0.00                     | 1505.00                      |
| 5.00         | 2/ 1      | 3202.00            | 85                       | 13800.00         | -0.00 | -0.00 | 1795.00                  | 30.60                   | 0.016300 | -0.00                               | -0.00                     | 1705.00                      |
| 10.30        | 7/ 2      | 3531.00            | 94                       | 13800.00         | -0.00 | -0.00 | 1925.00                  | 30.60                   | 0.017500 | -0.00                               | -0.00                     | 1780.00                      |
| 15.30        | 4/ 3      | 838.00             | 22                       | 13200.00         | -0.00 | -0.00 | 900.00                   | 28.00                   | 0.008900 | -0.00                               | -0.00                     | 1180.00                      |
| 18.30        | 5/ 4      | 3618.00            | 96                       | 14200.00         | -0.00 | -0.00 | 2010.00                  | 32.40                   | 0.017200 | -0.00                               | -0.00                     | 1850.00                      |
| 19.30        | 4/ 5      | 838.00             | 22                       | 13110.00         | -0.00 | -0.00 | 885.00                   | 27.60                   | 0.008900 | -0.00                               | -0.00                     | 1175.00                      |
| 21.00        | 8/ 4      | 232.00             | 6                        | 13320.00         | -0.00 | -0.00 | 685.00                   | 28.50                   | 0.006700 | -0.00                               | -0.00                     | 1040.00                      |
| 23.00        | 7/ 8      | 94.00              | 2                        | 9840.00          | -0.00 | -0.00 | 555.00                   | 13.40                   | 0.011500 | -0.00                               | -0.00                     | 1175.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMPERATURE DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOX (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-----------------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 60                       | -0.00                             | -0.00                     | 31.00         | 2.54                | 42.00          | 62.00         | 5.00           | 69.00          | -0.00     | -0.00 | -0.00        |
| 85                       | -0.00                             | -0.00                     | 26.00         | 3.17                | 46.00          | 93.00         | 2.00           | 95.00          | -0.00     | -0.00 | -0.00        |
| 94                       | -0.00                             | -0.00                     | 23.00         | 3.42                | 44.00          | 102.00        | 3.00           | 105.00         | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                             | -0.00                     | 27.00         | 1.67                | 37.00          | 0.0           | 0.0            | 31.00          | -0.00     | -0.00 | -0.00        |
| 96                       | -0.00                             | -0.00                     | 21.00         | 3.64                | 46.00          | 0.0           | 0.0            | 105.00         | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                             | -0.00                     | 27.00         | 1.70                | 37.00          | 0.0           | 0.0            | 31.00          | -0.00     | -0.00 | -0.00        |
| 6                        | -0.00                             | -0.00                     | 27.00         | 1.33                | 46.00          | 0.0           | 0.0            | 22.00          | -0.00     | -0.00 | -0.00        |
| 2                        | -0.00                             | -0.00                     | 323.00        | 2.32                | 315.00         | 0.0           | 0.0            | 26.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FUEL CO LB/1K LB FUEL | MASS FUEL HC LB/1K LB FUEL | MASS FUEL NO2 LB/1K LB FUEL | MASS FUEL CO2 LB/1K LB FUEL | MASS FUEL NO LB/1K LB FUEL | MASS FUEL NOX LB/1K LB FUEL | MASS FUEL CO LB/HR | MASS FUEL HC LB/HR | MASS FUEL NO2 LB/HR | MASS FUEL CO2 LB/HR | MASS FUEL NO LB/HR | MASS FUEL NOX LB/HR |
|--------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| 60                       | 2.43                       | 1.89                       | 0.64                        | 3129.88                     | 7.99                       | 8.89                        | 3.53               | 2.74               | 0.93                | 4538.32             | 11.58              | 12.89               |
| 85                       | 1.63                       | 1.66                       | 0.21                        | 3131.76                     | 9.60                       | 9.81                        | 2.93               | 2.97               | 0.37                | 5621.50             | 17.24              | 17.61               |
| 94                       | 1.34                       | 1.47                       | 0.29                        | 3132.76                     | 9.77                       | 10.05                       | 2.58               | 2.83               | 0.55                | 6030.51             | 18.80              | 19.36               |
| 22                       | 3.22                       | 2.53                       | 0.0                         | 3126.89                     | 0.0                        | 6.07                        | 2.90               | 2.27               | 0.0                 | 2814.20             | 0.0                | 5.46                |
| 96                       | 1.15                       | 1.44                       | 0.0                         | 3133.11                     | 0.0                        | 9.45                        | 2.31               | 2.90               | 0.0                 | 6297.54             | 0.0                | 18.99               |
| 27                       | 3.16                       | 2.48                       | 0.0                         | 3127.10                     | 0.0                        | 5.96                        | 2.80               | 2.20               | 0.0                 | 2767.48             | 0.0                | 5.28                |
| 6                        | 4.03                       | 3.94                       | 0.0                         | 3121.74                     | 0.0                        | 5.40                        | 2.76               | 2.70               | 0.0                 | 2138.39             | 0.0                | 3.70                |
| 2                        | 27.07                      | 15.12                      | 0.0                         | 3054.06                     | 0.0                        | 3.58                        | 15.02              | 8.39               | 0.0                 | 1695.45             | 0.0                | 1.99                |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO2 LB/1K HP-HR | NOX LB/1K HP-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 60                       | 1.561          | 2008.994        | 1.211           | 5.126          | 0.413           | 5.705           |
| 85                       | 0.916          | 1755.623        | 0.929           | 5.384          | 0.116           | 5.500           |
| 94                       | 0.731          | 1707.877        | 0.801           | 5.325          | 0.157           | 5.482           |
| 22                       | 3.456          | 3358.235        | 2.712           | 0.0            | 0.0             | 6.517           |
| 96                       | 0.639          | 1740.614        | 0.802           | 0.0            | 0.0             | 5.249           |
| 27                       | 3.338          | 3302.487        | 2.620           | 0.0            | 0.0             | 6.296           |
| 6                        | 11.909         | 9217.203        | 11.620          | 0.0            | 0.0             | 15.939          |
| 2                        | 159.421        | 18036.691       | 89.266          | 0.0            | 0.0             | 21.131          |

CAL ID NUMBER: 5 ENGINE TYPE AND MODEL: T56-A78

SERIAL NUMBER: AE-101776

TEST ORGANIZATION: S W R I KELLY

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 15.074                    | 564.752               | 1.000              | 19.00                   | 4.773              | 178.84               | 26.691                | 35.67           | 0.13381          |
| TAKEOFF   | 1.000               | 3755.0      | 2.049                     | 2084.544              | 1.000              | 0.50                    | 0.017              | 17.37                | 0.983                 | 31.29           | 0.00055          |
| CLIMBOUT  | 0.900               | 3379.5      | 2.498                     | 1897.624              | 1.000              | 2.50                    | 0.104              | 79.07                | 1.317                 | 140.81          | 0.00074          |
| APPROACH  | 0.300               | 1126.5      | 3.041                     | 1043.322              | 1.000              | 4.50                    | 0.228              | 78.25                | 2.915                 | 84.49           | 0.00270          |
| TAXI-IDLE | 0.030               | 112.6       | 15.074                    | 564.752               | 1.000              | 7.00                    | 1.759              | 65.89                | 26.691                | 13.14           | 0.13381          |

TOTAL FOR CYCLE: 6.881 419.41 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 16.407  
 LBS POLLUTANT/1K HP-HR/CYCLE: 22.532  
 LBS POLLUTANT/1000K HP AT T.O.: 0.455

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 6.711                     | 564.752               | 1.000              | 19.00                   | 2.125              | 178.84               | 11.882                | 35.67           | 0.05957          |
| TAKEOFF   | 1.000               | 3755.0      | 2.760                     | 2084.544              | 1.000              | 0.50                    | 0.023              | 17.37                | 1.324                 | 31.29           | 0.00074          |
| CLIMBOUT  | 0.900               | 3379.5      | 2.758                     | 1897.624              | 1.000              | 2.50                    | 0.115              | 79.07                | 1.454                 | 140.81          | 0.00082          |
| APPROACH  | 0.300               | 1126.5      | 2.383                     | 1043.322              | 1.000              | 4.50                    | 0.179              | 78.25                | 2.284                 | 84.49           | 0.00212          |
| TAXI-IDLE | 0.030               | 112.6       | 6.711                     | 564.752               | 1.000              | 7.00                    | 0.783              | 65.89                | 11.882                | 13.14           | 0.05957          |

TOTAL FOR CYCLE: 3.225 419.41 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 7.688  
 LBS POLLUTANT/1K HP-HR/CYCLE: 10.558  
 LBS POLLUTANT/1000K HP AT T.O.: 6.126

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.292                     | 564.752               | 1.000              | 19.00                   | 0.726               | 178.84               | 4.059                 | 35.67           | 0.02035          |
| TAKEOFF   | 1.000               | 3755.0      | 20.240                    | 2084.544              | 1.000              | 0.50                    | 0.169               | 17.37                | 9.709                 | 31.29           | 0.00539          |
| CLIMBOUT  | 0.900               | 3379.5      | 18.988                    | 1897.624              | 1.000              | 2.50                    | 0.791               | 79.07                | 10.006                | 140.81          | 0.00562          |
| APPROACH  | 0.300               | 1126.5      | 6.983                     | 1043.322              | 1.000              | 4.50                    | 0.524               | 78.25                | 6.693                 | 84.49           | 0.00620          |
| TAXI-IDLE | 0.030               | 112.6       | 2.292                     | 564.752               | 1.000              | 7.00                    | 0.267               | 65.89                | 4.059                 | 13.14           | 0.02035          |

TOTAL FOR CYCLE: 2.477 419.41 305.41  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 5.905  
 LBS POLLUTANT/1K HP-HR/CYCLE: 8.110  
 LBS POLLUTANT/1000K HP AT T.O.: 44.917

DATE: 6/21/71

TEST ORGANIZATION: S M R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 6 ENGINE TYPE AND MODEL: T56-A7B SERIAL NUMBER: AE-104313

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 6027. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 29.19 FINISH 29.19

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0176

RELATIVE HUMIDITY: 66.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED TIME | TEST MODE | POWER THPUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
|              |           |                          |                    | N1               | N2                       |                         |          |                                     |                           |                              |
| 0.0          | 1/ 0      | 2456.00                  | 65                 | 13800.00         | -0.00                    | 1510.00                 | 31.20    | 0.013400                            | -0.00                     | 1850.00                      |
| 6.30         | 2/ 1      | 3355.00                  | 89                 | 13800.00         | -0.00                    | 1865.00                 | 31.20    | 0.016600                            | -0.00                     | 1712.00                      |
| 10.30        | 3/ 2      | 3662.00                  | 97                 | 13800.00         | -0.00                    | 1980.00                 | 31.20    | 0.017600                            | -0.00                     | 1775.00                      |
| 17.30        | 4/ 3      | 834.00                   | 22                 | 13100.00         | -0.00                    | 895.00                  | 28.10    | 0.008800                            | -0.00                     | 1146.00                      |
| 19.00        | 5/ 4      | 3728.00                  | 99                 | 14220.00         | -0.00                    | 2045.00                 | 33.00    | 0.017200                            | -0.00                     | 1860.00                      |
| 21.00        | 4/ 5      | 840.00                   | 22                 | 13200.00         | -0.00                    | 870.00                  | 28.60    | 0.008400                            | -0.00                     | 1132.00                      |
| 22.00        | 8/ 4      | 241.00                   | 6                  | 13420.00         | -0.00                    | 720.00                  | 29.50    | 0.006800                            | -0.00                     | 1026.00                      |
| 24.00        | 7/ 8      | 111.00                   | 2                  | 9980.00          | -0.00                    | 550.00                  | 15.90    | 0.009600                            | -0.00                     | 1084.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | -0.00                      | -0.00                     | 40.00         | 2.52                 | 0.0            | 63.00         | 9.00            | 72.00           | -0.00     | -0.00 | -0.00        |
| 89                       | -0.00                      | -0.00                     | 26.00         | 3.10                 | 0.0            | 90.00         | 8.00            | 98.00           | -0.00     | -0.00 | -0.00        |
| 97                       | -0.00                      | -0.00                     | 21.00         | 3.34                 | 0.0            | 97.00         | 7.00            | 104.00          | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                      | -0.00                     | 25.00         | 1.60                 | 0.0            | 24.00         | 5.00            | 29.00           | -0.00     | -0.00 | -0.00        |
| 99                       | -0.00                      | -0.00                     | 17.00         | 3.74                 | 0.0            | 0.0           | 0.0             | 96.00           | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                      | -0.00                     | 24.00         | 1.58                 | 0.0            | 0.0           | 0.0             | 29.00           | -0.00     | -0.00 | -0.00        |
| 6                        | -0.00                      | -0.00                     | 21.00         | 1.26                 | 0.0            | 17.00         | 6.00            | 23.00           | -0.00     | -0.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 217.00        | 1.94                 | 250.00         | 7.00          | 15.00           | 22.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 65                       | 3.17                      | 0.0                       | 1.17                       | 3133.90                    | 8.19                      | 9.36                       | 4.78              | 0.0               | 1.77               | 4732.18            | 12.37             | 14.13              |
| 89                       | 1.67                      | 0.0                       | 0.85                       | 3136.24                    | 9.52                      | 10.36                      | 3.12              | 0.0               | 1.58               | 5849.09            | 17.75             | 19.33              |
| 97                       | 1.26                      | 0.0                       | 0.69                       | 3136.90                    | 9.52                      | 10.21                      | 2.49              | 0.0               | 1.36               | 6211.06            | 18.86             | 20.22              |
| 22                       | 3.12                      | 0.0                       | 1.02                       | 3133.98                    | 4.91                      | 5.94                       | 2.79              | 0.0               | 0.92               | 2804.91            | 4.40              | 5.31               |
| 99                       | 0.91                      | 0.0                       | 0.0                        | 3137.45                    | 0.0                       | 8.42                       | 1.86              | 0.0               | 0.0                | 6416.07            | 0.0               | 17.22              |
| 22                       | 3.03                      | 0.0                       | 0.0                        | 3134.11                    | 0.0                       | 6.01                       | 2.64              | 0.0               | 0.0                | 2726.68            | 0.0               | 5.23               |
| 6                        | 3.32                      | 0.0                       | 1.56                       | 3133.65                    | 4.42                      | 5.98                       | 2.39              | 0.0               | 1.12               | 2256.23            | 3.18              | 4.31               |
| 2                        | 21.82                     | 14.40                     | 2.48                       | 3065.09                    | 1.16                      | 3.63                       | 12.00             | 7.92              | 1.36               | 1685.80            | 0.64              | 2.00               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 65                       | 1.946          | 1926.784         | 0.0             | 5.036          | 0.719            | 5.755            |
| 89                       | 0.931          | 1743.395         | 0.0             | 5.291          | 0.470            | 5.762            |
| 97                       | 0.679          | 1696.084         | 0.0             | 5.149          | 0.372            | 5.521            |
| 22                       | 3.345          | 3367.199         | 0.0             | 5.274          | 1.099            | 6.373            |
| 99                       | 0.498          | 1721.049         | 0.0             | 0.0            | 0.0              | 4.618            |
| 22                       | 3.138          | 3246.043         | 0.0             | 0.0            | 0.0              | 6.228            |
| 6                        | 9.731          | 9361.945         | 0.0             | 13.205         | 4.660            | 17.865           |
| 2                        | 108.119        | 15187.375        | 71.339          | 5.729          | 12.276           | 18.005           |

CAL ID NUMBER: 6 ENGINE TYPE AND MODEL: T56-A7B

SERIAL NUMBER: AE-104313

TEST ORGANIZATION: S W R I KELLY

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 14.231                    | 536.839               | 1.000              | 19.00                   | 4.506              | 170.00               | 26.509                | 35.67           | 0.12633          |
| TAKEOFF   | 1.000               | 3755.0      | 1.863                     | 2079.368              | 1.000              | 0.50                    | 0.016              | 17.33                | 0.896                 | 31.29           | 0.00050          |
| CLIMBOUT  | 0.900               | 3379.5      | 3.296                     | 1895.471              | 1.000              | 2.50                    | 0.137              | 78.98                | 1.739                 | 140.81          | 0.00098          |
| APPROACH  | 0.300               | 1126.5      | 3.389                     | 1076.472              | 1.000              | 4.50                    | 0.254              | 80.74                | 3.148                 | 84.49           | 0.00301          |
| TAXI-IDLE | 0.030               | 112.6       | 14.231                    | 536.839               | 1.000              | 7.00                    | 1.660              | 62.63                | 26.509                | 13.14           | 0.12633          |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 6.574  
 LBS POLLUTANT/1K HP-HR/CYCLE: 409.67  
 LBS POLLUTANT/1000K HP AT T.O.: 305.41

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 6.377                     | 536.839               | 1.000              | 19.00                   | 2.019              | 170.00               | 11.878                | 35.67           | 0.05661          |
| TAKEOFF   | 1.000               | 3755.0      | 0.064                     | 2079.368              | 1.000              | 0.50                    | 0.001              | 17.33                | 0.031                 | 31.29           | 0.00002          |
| CLIMBOUT  | 0.900               | 3379.5      | 0.044                     | 1895.471              | 1.000              | 2.50                    | 0.002              | 78.98                | 0.023                 | 140.81          | 0.00001          |
| APPROACH  | 0.300               | 1126.5      | 0.0                       | 1076.472              | 1.000              | 4.50                    | 0.0                | 80.74                | 0.0                   | 84.49           | 0.0              |
| TAXI-IDLE | 0.030               | 112.6       | 6.377                     | 536.839               | 1.000              | 7.00                    | 0.744              | 62.63                | 11.878                | 13.14           | 0.05661          |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 2.766  
 LBS POLLUTANT/1K HP-HR/CYCLE: 409.67  
 LBS POLLUTANT/1000K HP AT T.O.: 305.41

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.108                     | 536.839               | 1.000              | 19.00                   | 0.667               | 170.00               | 3.926                 | 35.67           | 0.01871          |
| TAKEOFF   | 1.000               | 3755.0      | 22.790                    | 2079.368              | 1.000              | 0.50                    | 0.190               | 17.33                | 10.960                | 31.29           | 0.00607          |
| CLIMBOUT  | 0.900               | 3379.5      | 20.198                    | 1895.471              | 1.000              | 2.50                    | 0.842               | 78.98                | 10.656                | 140.81          | 0.00598          |
| APPROACH  | 0.300               | 1126.5      | 7.037                     | 1076.472              | 1.000              | 4.50                    | 0.528               | 80.74                | 6.537                 | 84.49           | 0.00625          |
| TAXI-IDLE | 0.030               | 112.6       | 2.108                     | 536.839               | 1.000              | 7.00                    | 0.246               | 62.63                | 3.926                 | 13.14           | 0.01871          |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 2.473  
 LBS POLLUTANT/1K HP-HR/CYCLE: 409.67  
 LBS POLLUTANT/1000K HP AT T.O.: 305.41

DATE: 6/22/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMREP: 7 ENGINE TYPE AND MODEL: T56-A7B SERIAL NUMBER: AE-101889

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 8488. HRS

TIME SINCE MNT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.01 FINISH 29.01

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0199

RELATIVE HUMIDITY: 72.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR 2ND LAST RUN

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | N1    | N2    | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|-------|-------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2281.00            | 60                       | 13800.00         | -0.00 | -0.00 | 1480.00                  | 30.60                   | 0.013400 | -0.00                               | -0.00                     | 1510.00                      |
| 7.35         | 2/ 1      | 3180.00            | 84                       | 13800.00         | -0.00 | -0.00 | 1825.00                  | 30.60                   | 0.016600 | -0.00                               | -0.00                     | 1710.00                      |
| 13.35        | 3/ 2      | 3487.00            | 92                       | 13800.00         | -0.00 | -0.00 | 1960.00                  | 30.60                   | 0.017800 | -0.00                               | -0.00                     | 1780.00                      |
| 19.35        | 4/ 3      | 3400.00            | 22                       | 13240.00         | -0.00 | -0.00 | 890.00                   | 28.20                   | 0.008800 | -0.00                               | -0.00                     | 1164.00                      |
| 21.37        | 5/ 4      | 3510.00            | 93                       | 14260.00         | -0.00 | -0.00 | 1975.00                  | 32.40                   | 0.016900 | -0.00                               | -0.00                     | 1858.00                      |
| 22.15        | 6/ 5      | 320.00             | 21                       | 13250.00         | -0.00 | -0.00 | 895.00                   | 28.20                   | 0.008800 | -0.00                               | -0.00                     | 1164.00                      |
| 23.15        | 7/ 4      | 118.00             | 3                        | 9910.00          | -0.00 | -0.00 | 575.00                   | 14.60                   | 0.010900 | -0.00                               | -0.00                     | 1130.00                      |
| 24.50        | 8/ 7      | 328.00             | 8                        | 13330.00         | -0.00 | -0.00 | 745.00                   | 28.60                   | 0.007200 | -0.00                               | -0.00                     | 1055.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 60                       | -0.00                      | -0.00                     | 27.00         | 2.53                 | 43.00          | 60.00         | 7.00            | 67.00           | -0.00     | -0.00 | -0.00        |
| 84                       | -0.00                      | -0.00                     | 26.00         | 3.16                 | 41.00          | 83.00         | 7.00            | 90.00           | -0.00     | -0.00 | -0.00        |
| 92                       | -0.00                      | -0.00                     | 24.00         | 3.47                 | 4.10           | 93.00         | 6.00            | 99.00           | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                      | -0.00                     | 29.00         | 1.71                 | 41.00          | 0.0           | 0.0             | 32.00           | -0.00     | -0.00 | -0.00        |
| 93                       | -0.00                      | -0.00                     | 25.00         | 3.76                 | 42.00          | 0.0           | 0.0             | 100.00          | -0.00     | -0.00 | -0.00        |
| 21                       | -0.00                      | -0.00                     | 29.00         | 1.71                 | 42.00          | 0.0           | 0.0             | 31.00           | -0.00     | -0.00 | -0.00        |
| 3                        | -0.00                      | -0.00                     | 299.00        | 2.15                 | 250.00         | 9.00          | 16.00           | 25.00           | -0.00     | -0.00 | -0.00        |
| 8                        | -0.00                      | -0.00                     | 32.00         | 1.40                 | 45.00          | 0.0           | 0.0             | 25.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 60                       | 2.13                      | 1.94                      | 0.91                       | 3130.21                    | 7.76                      | 8.67                       | 3.15              | 2.87              | 1.34               | 4632.71            | 11.49             | 12.83              |
| 84                       | 1.64                      | 1.48                      | 0.73                       | 3132.23                    | 8.60                      | 9.33                       | 2.99              | 2.70              | 1.32               | 5716.32            | 15.70             | 17.02              |
| 92                       | 1.40                      | 0.14                      | 0.58                       | 3136.30                    | 8.97                      | 9.49                       | 2.75              | 0.27              | 1.13               | 6147.14            | 17.47             | 18.60              |
| 22                       | 3.37                      | 2.73                      | 0.0                        | 3126.08                    | 0.0                       | 6.12                       | 3.00              | 2.43              | 0.0                | 2782.21            | 0.0               | 5.44               |
| 93                       | 1.33                      | 1.28                      | 0.0                        | 3133.29                    | 0.0                       | 8.71                       | 2.62              | 2.52              | 0.0                | 6188.24            | 0.0               | 17.21              |
| 21                       | 3.37                      | 2.80                      | 0.0                        | 3125.89                    | 0.0                       | 5.92                       | 3.02              | 2.50              | 0.0                | 2797.68            | 0.0               | 5.30               |
| 3                        | 27.09                     | 12.97                     | 2.38                       | 3060.72                    | 1.34                      | 3.72                       | 15.58             | 7.46              | 1.37               | 1759.91            | 0.77              | 2.14               |
| 8                        | 4.54                      | 3.66                      | 0.0                        | 3121.71                    | 0.0                       | 5.83                       | 3.38              | 2.72              | 0.0                | 2325.67            | 0.0               | 4.34               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 60                       | 1.179          | 2011.000         | 1.258           | 5.035          | 0.587            | 5.623            |
| 84                       | 0.941          | 1797.585         | 0.850           | 4.936          | 0.416            | 5.352            |
| 92                       | 0.787          | 1762.873         | 0.077           | 5.011          | 0.323            | 5.335            |
| 22                       | 3.575          | 3312.153         | 2.895           | 0.0            | 0.0              | 6.480            |
| 93                       | 0.746          | 1763.032         | 0.718           | 0.0            | 0.0              | 4.907            |
| 21                       | 3.683          | 3411.800         | 3.055           | 0.0            | 0.0              | 6.466            |
| 3                        | 132.009        | 14914.516        | 63.215          | 6.527          | 11.603           | 18.130           |
| 8                        | 10.315         | 1090.457         | 8.307           | 0.0            | 0.0              | 13.236           |

CAL ID NUMBER: 7 ENGINE TYPE AND MODEL: T56-A7B  
TEST ORGANIZATION: S W R I KELLY

SERIAL NUMBER: AE-101889

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 14.701                    | 427.346               | 1.000              | 19.00                   | 4.655              | 135.33               | 34.400                | 35.67           | 0.13050          |
| TAKEOFF   | 1.000               | 3755.0      | 2.436                     | 2070.004              | 1.000              | 0.50                    | 0.020              | 17.25                | 1.177                 | 31.29           | 0.00065          |
| CLIMBOUT  | 0.900               | 3379.5      | 2.752                     | 1920.723              | 1.000              | 2.50                    | 0.115              | 80.03                | 1.433                 | 140.81          | 0.00081          |
| APPROACH  | 0.300               | 1126.5      | 3.251                     | 1063.044              | 1.000              | 4.50                    | 0.244              | 79.73                | 3.058                 | 84.49           | 0.00289          |
| TAXI-IDLE | 0.030               | 112.6       | 14.701                    | 427.346               | 1.000              | 7.00                    | 1.715              | 49.86                | 34.400                | 13.14           | 0.13050          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 18.634  
LBS POLLUTANT/1K HP-HR/CYCLE: 22.099  
LBS POLLUTANT/1000K HP AT T.O.: 0.541

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 6.051                     | 427.346               | 1.000              | 19.00                   | 1.916              | 135.33               | 14.160                | 35.67           | 0.05372          |
| TAKEOFF   | 1.000               | 3755.0      | 1.637                     | 2070.004              | 1.000              | 0.50                    | 0.014              | 17.25                | 0.791                 | 31.29           | 0.00044          |
| CLIMBOUT  | 0.900               | 3379.5      | 2.091                     | 1920.723              | 1.000              | 2.50                    | 0.087              | 80.03                | 1.089                 | 140.81          | 0.00062          |
| APPROACH  | 0.300               | 1126.5      | 2.694                     | 1063.044              | 1.000              | 4.50                    | 0.202              | 79.73                | 2.535                 | 84.49           | 0.00239          |
| TAXI-IDLE | 0.030               | 112.6       | 6.051                     | 427.346               | 1.000              | 7.00                    | 0.706              | 49.86                | 14.160                | 13.14           | 0.05372          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.925  
LBS POLLUTANT/1K HP-HR/CYCLE: 8.076  
LBS POLLUTANT/1000K HP AT T.O.: 9.577  
LBS POLLUTANT/1000K HP AT T.O.: 3.634

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 1.519                     | 427.346               | 1.000              | 19.00                   | 0.481               | 135.33               | 3.554                 | 35.67           | 0.01348          |
| TAKEOFF   | 1.000               | 3755.0      | 19.138                    | 2070.004              | 1.000              | 0.50                    | 0.159               | 17.25                | 9.245                 | 31.29           | 0.00510          |
| CLIMBOUT  | 0.900               | 3379.5      | 17.872                    | 1920.723              | 1.000              | 2.50                    | 0.745               | 80.03                | 9.305                 | 140.81          | 0.00529          |
| APPROACH  | 0.300               | 1126.5      | 7.004                     | 1063.044              | 1.000              | 4.50                    | 0.525               | 79.73                | 6.589                 | 84.49           | 0.00622          |
| TAXI-IDLE | 0.030               | 112.6       | 1.519                     | 427.346               | 1.000              | 7.00                    | 0.177               | 49.86                | 3.554                 | 13.14           | 0.01348          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.088  
LBS POLLUTANT/1K HP-HR/CYCLE: 5.764  
LBS POLLUTANT/1000K HP AT T.O.: 6.836  
LBS POLLUTANT/1000K HP AT T.O.: 42.471

DATE: 6/22/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KFLY AFR

ENGINE DATA .....

CAL ID NUMBER: 8 ENGINE TYPE AND MODEL: T56-A7B SERIAL NUMBR: AE-101743

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 7032. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 90.00

ATMOSPHERIC PRESSURE: START 29.08 FINISH 29.08

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0164

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINF: TEMPERATURE, DEGREES C: 150.00. FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST FOR LAST RUN

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2105.00            | 56                       | 13800.00         | -0.00                    | 1410.00                 | 30.10    | 0.013000                            | -0.00                     | 1505.00                      |
| 7.00         | 7/ 1      | 3004.00            | 79                       | 13900.00         | -0.00                    | 1755.00                 | 30.10    | 0.016200                            | -0.00                     | 1710.00                      |
| 12.00        | 3/ 2      | 3355.00            | 89                       | 13800.00         | -0.00                    | 1880.00                 | 30.10    | 0.017300                            | -0.00                     | 1780.00                      |
| 15.00        | 4/ 3      | 840.00             | 22                       | 13240.00         | -0.00                    | 905.00                  | 27.40    | 0.009000                            | -0.00                     | 1206.00                      |
| 17.52        | 5/ 4      | 3533.00            | 94                       | 14000.00         | -0.00                    | 1910.00                 | 30.90    | 0.017200                            | -0.00                     | 1900.00                      |
| 19.30        | 4/ 5      | 676.00             | 18                       | 13300.00         | -0.00                    | 845.00                  | 28.00    | 0.008400                            | -0.00                     | 1152.00                      |
| 21.00        | 8/ 4      | 404.00             | 10                       | 13400.00         | -0.00                    | 765.00                  | 28.40    | 0.007500                            | -0.00                     | 1094.00                      |
| 23.00        | 7/ 8      | 142.00             | 3                        | 9930.00          | -0.00                    | 585.00                  | 15.30    | 0.010600                            | -0.00                     | 1178.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 56                       | -0.00                      | -0.00                     | 34.00         | 2.35                 | 0.0            | 71.00         | 8.00            | 79.00           | -0.00     | -0.00 | -0.00        |
| 79                       | -0.00                      | -0.00                     | 34.00         | 2.35                 | 0.0            | 71.00         | 8.00            | 79.00           | -0.00     | -0.00 | -0.00        |
| 89                       | -0.00                      | -0.00                     | 13.00         | 3.20                 | 0.0            | 113.00        | 5.00            | 118.00          | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                      | -0.00                     | 14.00         | 1.67                 | 0.0            | 27.00         | 10.00           | 37.00           | -0.00     | -0.00 | -0.00        |
| 94                       | -0.00                      | -0.00                     | 10.00         | 3.60                 | 0.0            | 0.0           | 0.0             | 119.00          | -0.00     | -0.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 13.00         | 1.55                 | 0.0            | 0.0           | 0.0             | 32.00           | -0.00     | -0.00 | -0.00        |
| 10                       | -0.00                      | -0.00                     | 13.00         | 1.38                 | 0.0            | 0.0           | 0.0             | 28.00           | -0.00     | -0.00 | -0.00        |
| 3                        | -0.00                      | -0.00                     | 259.00        | 2.14                 | 215.00         | 12.00         | 16.00           | 28.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 56                       | 2.49                      | 0.0                       | 1.12                       | 3134.34                    | 9.90                      | 11.02                      | 4.07              | 0.0               | 1.57               | 4419.41            | 13.96             | 15.53              |
| 79                       | 2.49                      | 0.0                       | 1.12                       | 3134.34                    | 9.90                      | 11.02                      | 5.07              | 0.0               | 1.96               | 5500.76            | 17.37             | 19.33              |
| 89                       | 0.81                      | 0.0                       | 0.51                       | 3137.60                    | 11.58                     | 12.10                      | 1.53              | 0.0               | 0.96               | 5898.68            | 21.78             | 22.74              |
| 22                       | 1.67                      | 0.0                       | 1.96                       | 3136.24                    | 5.30                      | 7.26                       | 1.51              | 0.0               | 1.78               | 2838.30            | 4.80              | 6.57               |
| 94                       | 0.55                      | 0.0                       | 0.0                        | 3138.00                    | 0.0                       | 10.84                      | 1.06              | 0.0               | 0.0                | 5993.58            | 0.0               | 20.71              |
| 18                       | 1.67                      | 0.0                       | 0.0                        | 3136.24                    | 0.0                       | 6.77                       | 1.41              | 0.0               | 0.0                | 2650.13            | 0.0               | 5.72               |
| 10                       | 1.88                      | 0.0                       | 1.0                        | 3135.92                    | 0.0                       | 6.65                       | 1.44              | 0.0               | 0.0                | 2398.98            | 0.0               | 5.09               |
| 3                        | 24.56                     | 11.24                     | 2.40                       | 3069.45                    | 1.80                      | 4.20                       | 14.37             | 6.58              | 1.40               | 1795.63            | 1.05              | 2.46               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 56                       | 1.933          | 2099.484         | 0.0             | 6.631          | 0.747            | 7.378            |
| 79                       | 1.686          | 1811.145         | 0.0             | 5.784          | 0.652            | 6.435            |
| 89                       | 0.455          | 1758.175         | 0.0             | 6.490          | 0.287            | 6.778            |
| 22                       | 1.803          | 3378.927         | 0.0             | 5.711          | 2.115            | 7.826            |
| 94                       | 0.300          | 1696.456         | 0.0             | 0.0            | 0.0              | 5.867            |
| 18                       | 2.093          | 3920.303         | 0.0             | 0.0            | 0.0              | 8.461            |
| 10                       | 3.560          | 5938.063         | 0.0             | 0.0            | 0.0              | 12.595           |
| 3                        | 101.165        | 12645.273        | 46.308          | 7.413          | 9.884            | 17.296           |

CAL ID NUMBER: 8 ENGINE TYPE AND MODEL: T56-A7B  
TEST ORGANIZATION: S W R I KELLY

SERIAL NUMBER: AE-101743

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 16.345                    | 470.568               | 1.000              | 19.00                   | 5.176              | 149.01               | 34.735                | 35.67           | 0.14510          |
| TAKEOFF   | 1.000               | 3755.0      | 0.0                       | 1960.124              | 1.000              | 0.50                    | 0.0                | 16.33                | 0.0                   | 31.29           | 0.0              |
| CLIMBOUT  | 0.900               | 3379.5      | 2.413                     | 1864.996              | 1.000              | 2.50                    | 0.101              | 77.71                | 1.294                 | 140.81          | 0.00071          |
| APPROACH  | 0.300               | 1126.5      | 2.007                     | 1039.307              | 1.000              | 4.50                    | 0.151              | 77.95                | 1.931                 | 84.49           | 0.00178          |
| TAXI-IDLE | 0.030               | 112.6       | 16.345                    | 470.568               | 1.000              | 7.00                    | 1.907              | 54.90                | 34.735                | 13.14           | 0.14510          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.334  
LBS POLLUTANT/1K HP-HR/CYCLE: 19.510  
LBS POLLUTANT/1000K HP AT T.O.: 24.014  
0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 7.052                     | 470.568               | 1.000              | 19.00                   | 2.233              | 149.01               | 14.987                | 35.67           | 0.06260          |
| TAKEOFF   | 1.000               | 3755.0      | 0.0                       | 1960.124              | 1.000              | 0.50                    | 0.0                | 16.33                | 0.0                   | 31.29           | 0.0              |
| CLIMBOUT  | 0.900               | 3379.5      | 0.009                     | 1864.996              | 1.000              | 2.50                    | 0.000              | 77.71                | 0.005                 | 140.81          | 0.00000          |
| APPROACH  | 0.300               | 1126.5      | 0.047                     | 1039.307              | 1.000              | 4.50                    | 0.004              | 77.95                | 0.045                 | 84.49           | 0.00004          |
| TAXI-IDLE | 0.030               | 112.6       | 7.052                     | 470.568               | 1.000              | 7.00                    | 0.823              | 54.90                | 14.987                | 13.14           | 0.06260          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 3.060  
LBS POLLUTANT/1K HP-HR/CYCLE: 375.90  
LBS POLLUTANT/1000K HP AT T.O.: 10.019  
0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 1.652                     | 470.568               | 1.000              | 19.00                   | 0.523               | 149.01               | 3.511                 | 35.67           | 0.01467          |
| TAKEOFF   | 1.000               | 3755.0      | 21.094                    | 1960.124              | 1.000              | 0.50                    | 0.176               | 16.33                | 10.761                | 31.29           | 0.00562          |
| CLIMBOUT  | 0.900               | 3379.5      | 20.368                    | 1864.996              | 1.000              | 2.50                    | 0.849               | 77.71                | 10.921                | 140.81          | 0.00603          |
| APPROACH  | 0.300               | 1126.5      | 8.484                     | 1039.307              | 1.000              | 4.50                    | 0.636               | 77.95                | 8.163                 | 84.49           | 0.00753          |
| TAXI-IDLE | 0.030               | 112.6       | 1.652                     | 470.568               | 1.000              | 7.00                    | 0.193               | 54.90                | 3.511                 | 13.14           | 0.01467          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.377  
LBS POLLUTANT/1K HP-HR/CYCLE: 375.90  
LBS POLLUTANT/1000K HP AT T.O.: 7.782  
46.812

DATE: 6/23/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA .....

CAL ID NUMBER: 9 ENGINE TYPE AND MODEL: T56-A7B

SERIAL NUMBER: AE-101695

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 4828. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4

FUEL H/C RATIO: 0.995

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 29.12 FINISH 29.12

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0170

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 9

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST THREE RUNS

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHIP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|------------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                    |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 0.0             | 1/ 0         | 2237.00                            | 59                       | 13800.00               | -0.00                             | 1450.00                       | 30.50       | 0.013200                                     | -0.00                              | 1505.00                               |
| 5.00            | 2/ 1         | 3114.00                            | 82                       | 13800.00               | -0.00                             | 1795.00                       | 30.50       | 0.016300                                     | -0.00                              | 1710.00                               |
| 10.00           | 3/ 2         | 3443.00                            | 91                       | 13800.00               | -0.00                             | 1930.00                       | 30.50       | 0.017600                                     | -0.00                              | 1775.00                               |
| 15.30           | 4/ 3         | 651.00                             | 17                       | 13230.00               | -0.00                             | 815.00                        | 28.00       | 0.008100                                     | -0.00                              | 1132.00                               |
| 17.00           | 5/ 4         | 3548.00                            | 94                       | 13800.00               | -0.00                             | 1945.00                       | 30.50       | 0.017700                                     | -0.00                              | 1760.00                               |
| 18.30           | 8/ 5         | 363.00                             | 9                        | 13430.00               | -0.00                             | 750.00                        | 28.90       | 0.007200                                     | -0.00                              | 1080.00                               |
| 20.30           | 7/ 8         | 126.00                             | 3                        | 9.92                   | -0.00                             | 565.00                        | 14.90       | 0.010500                                     | -0.00                              | 1152.00                               |
| 22.00           | 7/ 7         | 126.00                             | 3                        | 9.91                   | -0.00                             | 580.00                        | 15.00       | 0.010700                                     | -0.00                              | 1150.00                               |
| 29.30           | 7/ 7         | 126.00                             | 3                        | 9.90                   | -0.00                             | 570.00                        | 14.60       | 0.010900                                     | -0.00                              | 1150.00                               |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>x<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 59                                | -0.00                               | -0.00                              | 42.00               | 2.44                          | 4.00                 | 71.00               | 7.00                     | 78.00                    | -0.00     | -0.00 | -0.00        |
| 82                                | -0.00                               | -0.00                              | 35.00               | 3.07                          | 4.00                 | 103.00              | 5.00                     | 108.00                   | -0.00     | -0.00 | -0.00        |
| 91                                | -0.00                               | -0.00                              | 30.00               | 3.78                          | 2.00                 | 109.00              | 5.00                     | 114.00                   | -0.00     | -0.00 | -0.00        |
| 17                                | -0.00                               | -0.00                              | 30.00               | 1.67                          | 3.00                 | 28.00               | 4.00                     | 32.00                    | -0.00     | -0.00 | -0.00        |
| 94                                | -0.00                               | -0.00                              | 29.00               | 3.38                          | 3.00                 | 0.0                 | 0.0                      | 117.00                   | -0.00     | -0.00 | -0.00        |
| 9                                 | -0.00                               | -0.00                              | 31.00               | 1.46                          | 4.00                 | 23.00               | 5.00                     | 28.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | -0.00                               | -0.00                              | 261.00              | 2.12                          | 162.00               | 13.00               | 16.00                    | 29.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | -0.00                               | -0.00                              | 270.00              | 2.16                          | 175.00               | 12.00               | 17.00                    | 29.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | -0.00                               | -0.00                              | 270.00              | 2.19                          | 171.00               | 12.00               | 17.00                    | 29.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 59                                | 3.70                               | 0.20                               | 1.01                                | 3375.65                             | 10.77                              | 11.28                               | 5.36                    | 0.29                    | 1.47                     | 4894.69                  | 14.89                   | 16.36                    |
| 82                                | 2.45                               | 0.16                               | 0.58                                | 3377.72                             | 11.85                              | 12.42                               | 4.40                    | 0.29                    | 1.03                     | 6063.00                  | 21.27                   | 22.30                    |
| 91                                | 1.97                               | 0.08                               | 0.44                                | 3378.72                             | 11.74                              | 12.28                               | 3.80                    | 0.14                    | 1.04                     | 6520.92                  | 22.65                   | 23.69                    |
| 17                                | 3.86                               | 0.22                               | 0.85                                | 3375.14                             | 5.92                               | 6.76                                | 3.15                    | 0.18                    | 0.69                     | 2750.91                  | 4.82                    | 5.51                     |
| 94                                | 1.85                               | 0.11                               | 0.0                                 | 3378.81                             | 0.0                                | 12.23                               | 3.59                    | 0.21                    | 0.0                      | 6571.79                  | 0.0                     | 23.78                    |
| 9                                 | 4.56                               | 0.34                               | 1.21                                | 3373.93                             | 5.56                               | 6.76                                | 3.42                    | 0.25                    | 0.91                     | 2530.45                  | 4.17                    | 5.07                     |
| 3                                 | 25.98                              | 9.24                               | 2.62                                | 3315.85                             | 2.13                               | 4.74                                | 14.68                   | 5.22                    | 1.48                     | 1873.46                  | 1.20                    | 2.68                     |
| 3                                 | 26.36                              | 9.79                               | 2.73                                | 3313.75                             | 1.92                               | 4.65                                | 15.29                   | 5.68                    | 1.58                     | 1921.97                  | 1.12                    | 2.70                     |
| 3                                 | 26.01                              | 9.44                               | 2.69                                | 3315.25                             | 1.90                               | 4.59                                | 14.83                   | 5.38                    | 1.53                     | 1889.70                  | 1.08                    | 2.62                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K HP-HR | CO<br>2<br>LB/1K HP-HR | THC<br>LB/1K HP-HR | NO<br>LB/1K HP-HR | NO<br>2<br>LB/1K HP-HR | NO<br>x<br>LB/1K HP-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 59                                | 2.397             | 2188.059               | 0.131              | 6.656             | 0.656                  | 7.312                  |
| 82                                | 1.413             | 1947.015               | 0.092              | 6.829             | 0.131                  | 7.160                  |
| 91                                | 1.103             | 1893.966               | 0.047              | 6.580             | 0.302                  | 6.882                  |
| 17                                | 4.831             | 4225.660               | 0.277              | 7.407             | 1.058                  | 8.465                  |
| 94                                | 1.011             | 1852.253               | 0.060              | 0.0               | 0.0                    | 6.703                  |
| 9                                 | 9.420             | 6970.926               | 0.696              | 11.480            | 2.496                  | 13.976                 |
| 3                                 | 116.504           | 14868.703              | 41.415             | 9.532             | 11.731                 | 21.263                 |
| 3                                 | 171.352           | 15253.746              | 45.047             | 8.859             | 12.550                 | 21.409                 |
| 3                                 | 117.680           | 14997.578              | 42.685             | 8.591             | 12.170                 | 20.761                 |

CAL ID NUMBER: 9 ENGINE TYPE AND MODEL: T56-A7B  
TEST ORGANIZATION: S W R I KELLY

SERIAL NUMBER: AE-101695

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.030               | 112.6       | 14.147                    | 540.310               | 1.000              | 19.00                   | 4.480              | 171.10               | 26.184                | 35.67           | 0.12559          |
| TAKEOFF                         | 1.000               | 3755.0      | 2.680                     | 2016.737              | 1.000              | 0.50                    | 0.022              | 16.81                | 1.329                 | 31.29           | 0.00071          |
| CLIMBOUT                        | 0.900               | 3379.5      | 3.626                     | 1893.884              | 1.000              | 2.50                    | 0.151              | 78.91                | 1.915                 | 140.81          | 0.00107          |
| APPROACH                        | 0.300               | 1126.5      | 4.214                     | 1046.024              | 1.000              | 4.50                    | 0.316              | 78.45                | 4.028                 | 84.49           | 0.00374          |
| TAXI-IDLE                       | 0.030               | 112.6       | 14.147                    | 540.310               | 1.000              | 7.00                    | 1.651              | 63.04                | 26.184                | 13.14           | 0.12559          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 6.620              | 408.30               |                       | 305.41          |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 16.213             |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 21.676             |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.595              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.030               | 112.6       | 4.685                     | 540.310               | 1.000              | 19.00                   | 1.483              | 171.10               | 8.670                 | 35.67           | 0.04159          |
| TAKEOFF                         | 1.000               | 3755.0      | 0.139                     | 2016.737              | 1.000              | 0.50                    | 0.001              | 16.81                | 0.069                 | 31.29           | 0.00004          |
| CLIMBOUT                        | 0.900               | 3379.5      | 0.161                     | 1893.884              | 1.000              | 2.50                    | 0.007              | 78.91                | 0.085                 | 140.81          | 0.00005          |
| APPROACH                        | 0.300               | 1126.5      | 0.171                     | 1046.024              | 1.000              | 4.50                    | 0.013              | 78.45                | 0.163                 | 84.49           | 0.00015          |
| TAXI-IDLE                       | 0.030               | 112.6       | 4.685                     | 540.310               | 1.000              | 7.00                    | 0.547              | 63.04                | 8.670                 | 13.14           | 0.04159          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 2.051              | 408.30               |                       | 305.41          |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 5.022              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 6.715              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.309              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.030               | 112.6       | 2.537                     | 540.310               | 1.000              | 19.00                   | 0.803               | 171.10               | 4.695                 | 35.67           | 0.02252          |
| TAKEOFF                         | 1.000               | 3755.0      | 24.308                    | 2016.737              | 1.000              | 0.50                    | 0.203               | 16.81                | 12.053                | 31.29           | 0.00647          |
| CLIMBOUT                        | 0.900               | 3379.5      | 23.462                    | 1893.884              | 1.000              | 2.50                    | 0.978               | 78.91                | 12.388                | 140.81          | 0.00694          |
| APPROACH                        | 0.300               | 1126.5      | 8.528                     | 1046.024              | 1.000              | 4.50                    | 0.640               | 78.45                | 8.152                 | 84.49           | 0.00757          |
| TAXI-IDLE                       | 0.030               | 112.6       | 2.537                     | 540.310               | 1.000              | 7.00                    | 0.296               | 63.04                | 4.695                 | 13.14           | 0.02252          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 2.919               | 408.30               |                       | 305.41          |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 7.149               |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 9.558               |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 53.945              |                      |                       |                 |                  |

DATE: 6/23/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBR: 10 ENGINE TYPE AND MODEL: T56-A7B

SERIAL NUMBER: AF-104192

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 5381. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 93.00 FINISH 94.00

ATMOSPHERIC PRESSURE: START 29.05 FINISH 29.05

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0127

RELATIVE HUMIDITY: 37.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATIO T.O. | ENGINE SPEED RPM N1 | ENGINE SPEED RPM N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|---------------------|---------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2083.00            | 55                       | 13900.00            | -0.00               | 1405.00                  | 29.90                   | 0.013100 | -0.00                               | -0.00                     | 1508.00                      |
| 5.00         | 2/ 1      | 2939.00            | 78                       | 13880.00            | -0.00               | 1740.00                  | 29.90                   | 0.016200 | -0.00                               | -0.00                     | 1710.00                      |
| 10.00        | 3/ 2      | 3216.00            | 85                       | 13900.00            | -0.00               | 1860.00                  | 29.90                   | 0.017300 | -0.00                               | -0.00                     | 1782.00                      |
| 15.30        | 4/ 3      | 720.00             | 19                       | 13340.00            | -0.00               | 860.00                   | 28.00                   | 0.008500 | -0.00                               | -0.00                     | 1180.00                      |
| 17.15        | 5/ 4      | 3458.00            | 92                       | 14320.00            | -0.00               | 1980.00                  | 32.10                   | 0.017100 | -0.00                               | -0.00                     | 1852.00                      |
| 18.45        | 6/ 5      | 721.00             | 19                       | 13350.00            | -0.00               | 860.00                   | 28.00                   | 0.008500 | -0.00                               | -0.00                     | 1178.00                      |
| 19.30        | 8/ 4      | 236.00             | 6                        | 13490.00            | -0.00               | 715.00                   | 28.60                   | 0.006900 | -0.00                               | -0.00                     | 1076.00                      |
| 22.00        | 7/ 8      | 63.00              | 1                        | 9990.00             | -0.00               | 565.00                   | 15.20                   | 0.010300 | -0.00                               | -0.00                     | 1170.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 55                       | -0.00                      | -0.00                     | 44.00         | 2.39                 | 0.0            | 73.00         | 8.00            | 81.00           | -0.00     | -0.00 | -0.00        |
| 78                       | -0.00                      | -0.00                     | 29.00         | 3.02                 | 0.0            | 110.00        | 6.00            | 116.00          | -0.00     | -0.00 | -0.00        |
| 85                       | -0.00                      | -0.00                     | 24.00         | 3.22                 | 0.0            | 119.00        | 7.00            | 126.00          | -0.00     | -0.00 | -0.00        |
| 19                       | -0.00                      | -0.00                     | 28.00         | 1.66                 | 0.0            | 0.0           | 0.0             | 39.00           | -0.00     | -0.00 | -0.00        |
| 92                       | -0.00                      | -0.00                     | 22.00         | 1.52                 | 0.0            | 0.0           | 0.0             | 128.00          | -0.00     | -0.00 | -0.00        |
| 19                       | -0.00                      | -0.00                     | 26.00         | 1.59                 | 0.0            | 0.0           | 0.0             | 35.00           | -0.00     | -0.00 | -0.00        |
| 6                        | -0.00                      | -0.00                     | 24.00         | 1.33                 | 0.0            | 0.0           | 0.0             | 29.00           | -0.00     | -0.00 | -0.00        |
| 1                        | -0.00                      | -0.00                     | 312.00        | 2.10                 | 270.00         | 0.0           | 0.0             | 31.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 55                       | 3.67                      | 0.0                       | 1.10                       | 3133.10                    | 10.00                     | 11.10                      | 5.16              | 0.0               | 1.54               | 4402.01            | 14.06             | 15.60              |
| 78                       | 1.92                      | 0.0                       | 0.65                       | 3135.86                    | 11.94                     | 12.59                      | 3.33              | 0.0               | 1.13               | 5456.39            | 20.78             | 21.91              |
| 85                       | 1.49                      | 0.0                       | 0.71                       | 3136.53                    | 12.12                     | 12.83                      | 2.77              | 0.0               | 1.33               | 5833.95            | 22.54             | 23.86              |
| 19                       | 3.36                      | 0.0                       | 0.0                        | 3133.59                    | 0.0                       | 7.70                       | 2.89              | 0.0               | 0.0                | 2694.88            | 0.0               | 6.62               |
| 92                       | 1.25                      | 0.0                       | 0.0                        | 3136.91                    | 0.0                       | 11.92                      | 2.47              | 0.0               | 0.0                | 6211.08            | 0.0               | 23.61              |
| 19                       | 3.26                      | 0.0                       | 0.0                        | 3133.75                    | 0.0                       | 7.21                       | 2.80              | 0.0               | 0.0                | 2695.02            | 0.0               | 6.20               |
| 6                        | 3.60                      | 0.0                       | 0.0                        | 3133.22                    | 0.0                       | 7.14                       | 2.57              | 0.0               | 0.0                | 2240.25            | 0.0               | 5.11               |
| 1                        | 28.88                     | 14.31                     | 0.0                        | 3054.23                    | 0.0                       | 4.71                       | 16.32             | 8.09              | 0.0                | 1725.64            | 0.0               | 2.66               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 55                       | 2.476          | 2113.302         | 0.0             | 6.748          | 0.739            | 7.487            |
| 78                       | 1.135          | 1856.548         | 0.0             | 7.069          | 0.386            | 7.455            |
| 85                       | 0.861          | 1814.040         | 0.0             | 7.008          | 0.412            | 7.421            |
| 19                       | 4.018          | 3742.895         | 0.0             | 0.0            | 0.0              | 9.193            |
| 92                       | 0.714          | 1796.149         | 0.0             | 0.0            | 0.0              | 6.828            |
| 19                       | 3.890          | 3737.895         | 0.0             | 0.0            | 0.0              | 8.602            |
| 6                        | 10.902         | 9492.598         | 0.0             | 0.0            | 0.0              | 21.638           |
| 1                        | 259.004        | 27391.109        | 128.369         | 0.0            | 0.0              | 42.270           |

CAL ID NUMBER: 10 ENGINE TYPE AND MODEL: T56-A7B  
TEST ORGANIZATION: S W R J KELLY

SERIAL NUMBER: AE-104192

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 9.139                     | 588.560               | 1.000              | 19.00                   | 2.894              | 186.38               | 15.527                | 35.67           | 0.08112          |
| TAKEOFF   | 1.000               | 3755.0      | 1.700                     | 2160.290              | 1.000              | 0.50                    | 0.014              | 18.00                | 0.787                 | 31.29           | 0.00045          |
| CLIMBOUT  | 0.900               | 3379.5      | 2.475                     | 1941.074              | 1.000              | 2.50                    | 0.103              | 80.88                | 1.275                 | 140.81          | 0.00073          |
| APPROACH  | 0.300               | 1126.5      | 3.811                     | 1068.830              | 1.000              | 4.50                    | 0.286              | 80.16                | 3.565                 | 84.49           | 0.00338          |
| TAXI-IDLE | 0.030               | 112.6       | 9.139                     | 588.560               | 1.000              | 7.00                    | 1.066              | 68.67                | 15.527                | 13.14           | 0.08112          |

TOTAL FOR CYCLE: 4.363 434.09 305.41  
LBS POLLUTANT/1K LB FUEL/CYCLE: 10.051  
LBS POLLUTANT/1K HP-HR/CYCLE: 14.286  
LBS POLLUTANT/1000K HP AT T.O.: 0.377

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 3.138                     | 588.560               | 1.000              | 19.00                   | 0.994              | 186.38               | 5.332                 | 35.67           | 0.02786          |
| TAKEOFF   | 1.000               | 3755.0      | 0.0                       | 2160.290              | 1.000              | 0.50                    | 0.0                | 18.00                | 0.0                   | 31.29           | 0.0              |
| CLIMBOUT  | 0.900               | 3379.5      | 0.002                     | 1941.074              | 1.000              | 2.50                    | 0.000              | 80.88                | 0.001                 | 140.81          | 0.00000          |
| APPROACH  | 0.300               | 1126.5      | 0.019                     | 1068.830              | 1.000              | 4.50                    | 0.001              | 80.16                | 0.018                 | 84.49           | 0.00002          |
| TAXI-IDLE | 0.030               | 112.6       | 3.138                     | 588.560               | 1.000              | 7.00                    | 0.366              | 68.67                | 5.332                 | 13.14           | 0.02786          |

TOTAL FOR CYCLE: 1.361 434.09 305.41  
LBS POLLUTANT/1K LB FUEL/CYCLE: 3.136  
LBS POLLUTANT/1K HP-HR/CYCLE: 4.458  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.889                     | 588.560               | 1.000              | 19.00                   | 0.915               | 186.38               | 4.909                 | 35.67           | 0.02565          |
| TAKEOFF   | 1.000               | 3755.0      | 30.241                    | 2160.290              | 1.000              | 0.50                    | 0.252               | 18.00                | 13.998                | 31.29           | 0.00805          |
| CLIMBOUT  | 0.900               | 3379.5      | 25.268                    | 1941.074              | 1.000              | 2.50                    | 1.053               | 80.88                | 13.018                | 140.81          | 0.00748          |
| APPROACH  | 0.300               | 1126.5      | 9.101                     | 1068.830              | 1.000              | 4.50                    | 0.683               | 80.16                | 8.515                 | 84.49           | 0.00808          |
| TAXI-IDLE | 0.030               | 112.6       | 2.889                     | 588.560               | 1.000              | 7.00                    | 0.337               | 68.67                | 4.909                 | 13.14           | 0.02565          |

TOTAL FOR CYCLE: 3.239 434.09 305.41  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.463  
LBS POLLUTANT/1K HP-HR/CYCLE: 10.607  
LBS POLLUTANT/1000K HP AT T.O.: 67.112

DATE: 6/24/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA .....

CAL ID NUMBER: 13 ENGINE TYPE AND MODEL: T56-A7B

SERIAL NUMBER: AE-103202

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 4879. HRS

TIME SINCE MNT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 29.12 FINISH 29.12

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0153

RELATIVE HUMIDITY: 48.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED<br>TIME | TEST<br>MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|--------------------------|-----------------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 2281.00                  | 60                                | 1379.00                | -0.00                             | 1465.00                       | 0.013300    | -0.00                                        | -0.00                              | 1505.00                               |
| 4.30            | 2/ 1         | 3202.00                  | 85                                | 13800.00               | -0.00                             | 1820.00                       | 0.016500    | -0.00                                        | -0.00                              | 1710.00                               |
| 9.50            | 3/ 2         | 3465.00                  | 92                                | 13800.00               | -0.00                             | 1950.00                       | 0.017600    | -0.00                                        | -0.00                              | 1780.00                               |
| 15.30           | 4/ 3         | 504.00                   | 13                                | 13240.00               | -0.00                             | 790.00                        | 0.007700    | -0.00                                        | -0.00                              | 1100.00                               |
| 17.00           | 5/ 4         | 3710.00                  | 98                                | 14250.00               | -0.00                             | 2070.00                       | 0.017600    | -0.00                                        | -0.00                              | 1900.00                               |
| 18.45           | 4/ 5         | 442.00                   | 11                                | 13250.00               | -0.00                             | 770.00                        | 0.007600    | -0.00                                        | -0.00                              | 1082.00                               |
| 20.30           | 8/ 4         | 274.00                   | 7                                 | 13300.00               | -0.00                             | 715.00                        | 0.007000    | -0.00                                        | -0.00                              | 1040.00                               |
| 21.30           | 7/ 8         | 79.00                    | 2                                 | 9920.00                | -0.00                             | 555.00                        | 0.010100    | -0.00                                        | -0.00                              | 1124.00                               |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 60                                | -0.00                               | -0.00                              | 49.00               | 2.53                          | 0.0                  | 78.00               | 9.00                     | 87.00                    | -0.00     | -0.00 | -0.00        |
| 85                                | -0.00                               | -0.00                              | 38.00               | 3.11                          | 0.0                  | 109.00              | 9.00                     | 118.00                   | -0.00     | -0.00 | -0.00        |
| 92                                | -0.00                               | -0.00                              | 32.00               | 3.31                          | 0.0                  | 118.00              | 8.00                     | 126.00                   | -0.00     | -0.00 | -0.00        |
| 13                                | -0.00                               | -0.00                              | 36.00               | 1.51                          | 4.00                 | 0.0                 | 0.0                      | 32.00                    | -0.00     | -0.00 | -0.00        |
| 98                                | -0.00                               | -0.00                              | 31.00               | 3.45                          | 0.0                  | 117.00              | 0.0                      | 0.0                      | -0.00     | -0.00 | -0.00        |
| 11                                | -0.00                               | -0.00                              | 35.00               | 1.43                          | 4.00                 | 23.00               | 7.00                     | 30.00                    | -0.00     | -0.00 | -0.00        |
| 7                                 | -0.00                               | -0.00                              | 35.00               | 1.34                          | 4.00                 | 0.0                 | 0.0                      | 27.00                    | -0.00     | -0.00 | -0.00        |
| 2                                 | -0.00                               | -0.00                              | 279.00              | 2.04                          | 232.00               | 13.00               | 17.00                    | 30.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 60                                | 3.86                               | 0.0                                | 1.17                                | 3132.80                             | 10.10                              | 11.26                               | 5.66                    | 0.0                     | 1.71                     | 4589.55                  | 14.79                   | 16.50                    |
| 85                                | 2.44                               | 0.0                                | 0.95                                | 3135.04                             | 11.49                              | 12.44                               | 4.44                    | 0.0                     | 1.73                     | 5705.77                  | 20.91                   | 22.63                    |
| 92                                | 1.93                               | 0.0                                | 0.79                                | 3135.84                             | 11.69                              | 12.48                               | 1.76                    | 0.0                     | 1.55                     | 6114.88                  | 22.79                   | 24.33                    |
| 13                                | 4.75                               | 0.30                               | 0.0                                 | 3130.58                             | 0.0                                | 6.94                                | 3.75                    | 0.24                    | 0.0                      | 2473.16                  | 0.0                     | 5.48                     |
| 98                                | 1.79                               | 0.0                                | 0.0                                 | 3136.05                             | 11.12                              | 0.0                                 | 3.71                    | 0.0                     | 0.0                      | 6491.61                  | 23.01                   | 0.0                      |
| 11                                | 4.88                               | 0.12                               | 1.60                                | 3130.34                             | 5.26                               | 6.87                                | 3.75                    | 0.25                    | 1.23                     | 2410.16                  | 4.05                    | 5.29                     |
| 7                                 | 5.20                               | 0.34                               | 0.0                                 | 3129.76                             | 0.0                                | 6.59                                | 3.72                    | 0.24                    | 0.0                      | 2237.78                  | 0.0                     | 4.71                     |
| 2                                 | 26.65                              | 12.69                              | 2.67                                | 3062.17                             | 2.04                               | 4.71                                | 14.79                   | 7.05                    | 1.48                     | 1699.50                  | 1.13                    | 2.61                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K<br>HP-HR | CO<br>2<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>2<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|-----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| 60                                | 2.480                | 2012.081                  | 0.0                   | 6.485                | 0.748                     | 7.233                     |
| 85                                | 1.386                | 1781.940                  | 0.0                   | 6.529                | 0.539                     | 7.068                     |
| 92                                | 1.086                | 1764.757                  | 0.0                   | 6.577                | 0.446                     | 7.023                     |
| 13                                | 7.446                | 4907.059                  | 0.474                 | 0.0                  | 0.0                       | 10.871                    |
| 98                                | 1.001                | 1749.766                  | 0.0                   | 6.203                | 0.0                       | 0.0                       |
| 11                                | 8.495                | 5451.297                  | 0.556                 | 9.169                | 2.791                     | 11.960                    |
| 7                                 | 13.577               | 8167.086                  | 0.889                 | 0.0                  | 0.0                       | 17.203                    |
| 2                                 | 187.254              | 21512.723                 | 89.178                | 14.331               | 18.741                    | 33.073                    |

CAL ID NUMBER: 13 ENGINE TYPE AND MODEL: T56-A7B  
TEST ORGANIZATION: S W R I KELLY

SERIAL NUMBER: AE-103202

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 13.183                    | 582.649               | 1.000              | 19.00                   | 4.175              | 184.51               | 22.626                | 35.67           | 0.11703          |
| TAKEOFF   | 1.000               | 3755.0      | 3.472                     | 2091.033              | 1.000              | 0.50                    | 0.029              | 17.43                | 1.660                 | 31.29           | 0.00092          |
| CLIMBOUT  | 0.900               | 3379.5      | 4.006                     | 1916.847              | 1.000              | 2.50                    | 0.167              | 79.87                | 2.090                 | 140.81          | 0.00119          |
| APPROACH  | 0.300               | 1126.5      | 4.604                     | 1086.378              | 1.000              | 4.50                    | 0.345              | 81.48                | 4.238                 | 84.49           | 0.00409          |
| TAXI-IDLE | 0.030               | 112.6       | 13.183                    | 582.649               | 1.000              | 7.00                    | 1.598              | 67.98                | 22.626                | 13.14           | 0.11703          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.254  
LBS POLLUTANT/1K HP-HR/CYCLE: 14.501  
LBS POLLUTANT/1000K HP AT T.O.: 20.477  
LBS POLLUTANT/1000K HP AT T.O.: 0.770

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 5.258                     | 582.649               | 1.000              | 19.00                   | 1.665              | 184.51               | 9.025                 | 35.67           | 0.04668          |
| TAKEOFF   | 1.000               | 3755.0      | 0.0                       | 2091.033              | 1.000              | 0.50                    | 0.0                | 17.43                | 0.0                   | 31.29           | 0.0              |
| CLIMBOUT  | 0.900               | 3379.5      | 0.013                     | 1916.847              | 1.000              | 2.50                    | 0.001              | 79.87                | 0.007                 | 140.81          | 0.00000          |
| APPROACH  | 0.300               | 1126.5      | 0.162                     | 1086.378              | 1.000              | 4.50                    | 0.012              | 81.48                | 0.149                 | 84.49           | 0.00014          |
| TAXI-IDLE | 0.030               | 112.6       | 5.258                     | 582.649               | 1.000              | 7.00                    | 0.613              | 67.98                | 9.025                 | 13.14           | 0.04668          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.291  
LBS POLLUTANT/1K HP-HR/CYCLE: 5.313  
LBS POLLUTANT/1000K HP AT T.O.: 7.502  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.949                     | 582.649               | 1.000              | 19.00                   | 0.934               | 184.51               | 5.062                 | 35.67           | 0.02618          |
| TAKEOFF   | 1.000               | 3755.0      | 26.433                    | 2091.033              | 1.000              | 0.50                    | 0.220               | 17.43                | 12.641                | 31.29           | 0.00704          |
| CLIMBOUT  | 0.900               | 3379.5      | 23.969                    | 1916.847              | 1.000              | 2.50                    | 0.999               | 79.87                | 12.504                | 140.81          | 0.00709          |
| APPROACH  | 0.300               | 1126.5      | 9.336                     | 1086.378              | 1.000              | 4.50                    | 0.700               | 81.48                | 8.394                 | 84.49           | 0.00829          |
| TAXI-IDLE | 0.030               | 112.6       | 2.949                     | 582.649               | 1.000              | 7.00                    | 0.344               | 67.98                | 5.062                 | 13.14           | 0.02618          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 3.197  
LBS POLLUTANT/1K HP-HR/CYCLE: 7.414  
LBS POLLUTANT/1000K HP AT T.O.: 10.469  
LBS POLLUTANT/1000K HP AT T.O.: 58.661

DATE: 6/24/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 12 ENGINE TYPE AND MODEL: T56-A7KR SERIAL NUMBER: AF-104215

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: 5743. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 90.00

ATMOSPHERIC PRESSURE: START 29.14 FINISH 29.14

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0147

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR LAST RUN

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2105.00            | 56                       | 13810.00         | -0.00                    | 1410.00                 | 0.013000 | -0.00                               | -0.00                     | 1508.00                      |
| 5.30         | 2/ 1      | 2982.00            | 79                       | 13780.00         | -0.00                    | 1740.00                 | 0.016100 | -0.00                               | -0.00                     | 1710.00                      |
| 10.00        | 3/ 2      | 3268.00            | 87                       | 13800.00         | -0.00                    | 1850.00                 | 0.017000 | -0.00                               | -0.00                     | 1775.00                      |
| 16.15        | 4/ 3      | 840.00             | 27                       | 13240.00         | -0.00                    | 895.00                  | 0.008900 | -0.00                               | -0.00                     | 1204.00                      |
| 17.30        | 5/ 4      | 1470.00            | 92                       | 14200.00         | -0.00                    | 2052.00                 | 0.017900 | -0.00                               | -0.00                     | 1952.00                      |
| 19.00        | 4/ 5      | 840.00             | 22                       | 13240.00         | -0.00                    | 895.00                  | 0.009900 | -0.00                               | -0.00                     | 1208.00                      |
| 19.45        | 8/ 4      | 423.00             | 11                       | 13340.00         | -0.00                    | 765.00                  | 0.007500 | -0.00                               | -0.00                     | 1108.00                      |
| 22.00        | 7/ 8      | 141.00             | 3                        | 9890.00          | -0.00                    | 585.00                  | 0.010800 | -0.00                               | -0.00                     | 1202.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 56                       | -0.00                      | -0.00                     | 41.00         | 2.38                 | 0.0            | 66.00         | 7.00            | 73.00           | -0.00     | -0.00 | -0.00        |
| 79                       | -0.00                      | -0.00                     | 37.00         | 2.93                 | 0.0            | 98.00         | 7.00            | 105.00          | -0.00     | -0.00 | -0.00        |
| 87                       | -0.00                      | -0.00                     | 33.00         | 3.16                 | 0.0            | 108.00        | 5.00            | 113.00          | -0.00     | -0.00 | -0.00        |
| 92                       | -0.00                      | -0.00                     | 34.00         | 1.71                 | 0.0            | 0.0           | 0.0             | 35.00           | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                      | -0.00                     | 31.00         | 3.46                 | 0.0            | 0.0           | 0.0             | 113.00          | -0.00     | -0.00 | -0.00        |
| 22                       | -0.00                      | -0.00                     | 33.00         | 1.73                 | 0.0            | 0.0           | 0.0             | 35.00           | -0.00     | -0.00 | -0.00        |
| 11                       | -0.00                      | -0.00                     | 32.00         | 1.43                 | 0.0            | 0.0           | 0.0             | 28.00           | -0.00     | -0.00 | -0.00        |
| 3                        | -0.00                      | -0.00                     | 311.00        | 2.19                 | 228.00         | 11.00         | 18.00           | 29.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/FUEL | MASS EMI HC LB/FUEL | MASS EMI NO2 LB/FUEL | MASS EMI CO2 LB/FUEL | MASS EMI NO LB/FUEL | MASS EMI NOX LB/FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 56                       | 3.44                | 0.0                 | 0.96                 | 3133.47              | 9.08                | 10.05                | 4.84              | 0.0               | 1.34               | 4418.20            | 12.81             | 14.17              |
| 79                       | 2.57                | 0.0                 | 0.78                 | 3134.91              | 10.96               | 11.74                | 4.38              | 0.0               | 1.36               | 5454.75            | 19.07             | 20.44              |
| 87                       | 2.08                | 0.0                 | 0.52                 | 3135.60              | 11.20               | 11.72                | 3.86              | 0.0               | 0.96               | 5800.85            | 20.73             | 21.69              |
| 22                       | 3.96                | 0.0                 | 0.0                  | 3132.64              | 0.0                 | 6.70                 | 3.55              | 0.0               | 0.0                | 2803.72            | 0.0               | 6.00               |
| 92                       | 1.79                | 0.0                 | 0.0                  | 3136.06              | 0.0                 | 10.71                | 3.67              | 0.0               | 0.0                | 6435.20            | 0.0               | 21.97              |
| 22                       | 3.80                | 0.0                 | 0.0                  | 3132.90              | 0.0                 | 6.63                 | 3.40              | 0.0               | 0.0                | 2803.94            | 0.0               | 5.93               |
| 11                       | 4.46                | 0.0                 | 0.0                  | 3131.86              | 0.0                 | 6.41                 | 3.41              | 0.0               | 0.0                | 2395.88            | 0.0               | 4.90               |
| 3                        | 27.69               | 11.63               | 2.63                 | 3063.48              | 1.61                | 4.24                 | 16.20             | 6.80              | 1.54               | 1792.13            | 0.94              | 2.48               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 56                       | 2.301          | 2098.906         | 0.0             | 6.085          | 0.645            | 6.730            |
| 79                       | 1.470          | 1829.224         | 0.0             | 6.396          | 0.457            | 6.853            |
| 87                       | 1.180          | 1775.046         | 0.0             | 6.342          | 0.294            | 6.636            |
| 22                       | 4.224          | 3317.757         | 0.0             | 0.0            | 0.0              | 7.142            |
| 92                       | 1.057          | 1854.523         | 0.0             | 0.0            | 0.0              | 6.332            |
| 22                       | 4.052          | 3338.027         | 0.0             | 0.0            | 0.0              | 7.060            |
| 11                       | 8.067          | 5664.008         | 0.0             | 0.0            | 0.0              | 11.594           |
| 3                        | 114.876        | 12710.164        | 48.234          | 6.674          | 10.921           | 17.595           |

CAL ID NUMBER: 12 ENGINE TYPE AND MODEL: T56-A7K8  
TEST ORGANIZATION: S W R I KELLY

SERIAL NUMBER: AE-104215

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 21.649                    | 609.222               | 1.000              | 19.00                   | 6.855              | 192.92               | 35.535                | 35.67           | 0.19218          |
| TAKEOFF   | 1.000               | 3755.0      | 0.0                       | 2256.038              | 1.000              | 0.50                    | 0.0                | 18.80                | 0.0                   | 31.29           | 0.0              |
| CLIMBOUT  | 0.900               | 3379.5      | 1.666                     | 1953.967              | 1.000              | 2.50                    | 0.069              | 81.42                | 0.853                 | 140.81          | 0.00049          |
| APPROACH  | 0.300               | 1126.5      | 3.642                     | 1002.166              | 1.000              | 4.50                    | 0.273              | 75.16                | 3.635                 | 84.49           | 0.00323          |
| TAXI-IDLE | 0.030               | 112.6       | 21.649                    | 609.222               | 1.000              | 7.00                    | 2.526              | 71.08                | 35.535                | 13.14           | 0.19218          |

TOTAL FOR CYCLE: 9.724 439.37 305.41  
LBS POLLUTANT/1K LB FUEL/CYCLE: 22.131  
LBS POLLUTANT/1K HP-HR/CYCLE: 31.839  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 7.955                     | 609.222               | 1.000              | 19.00                   | 2.519              | 192.92               | 13.057                | 35.67           | 0.07062          |
| TAKEOFF   | 1.000               | 3755.0      | 0.0                       | 2256.038              | 1.000              | 0.50                    | 0.0                | 18.80                | 0.0                   | 31.29           | 0.0              |
| CLIMBOUT  | 0.900               | 3379.5      | 0.004                     | 1953.967              | 1.000              | 2.50                    | 0.000              | 81.42                | 0.002                 | 140.81          | 0.00000          |
| APPROACH  | 0.300               | 1126.5      | 0.0                       | 1002.166              | 1.000              | 4.50                    | 0.0                | 75.16                | 0.0                   | 84.49           | 0.0              |
| TAXI-IDLE | 0.030               | 112.6       | 7.955                     | 609.222               | 1.000              | 7.00                    | 0.928              | 71.08                | 13.057                | 13.14           | 0.07062          |

TOTAL FOR CYCLE: 3.447 439.37 305.41  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.846  
LBS POLLUTANT/1K HP-HR/CYCLE: 11.287  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 112.6       | 2.027                     | 609.222               | 1.000              | 19.00                   | 0.642               | 192.92               | 3.327                 | 35.67           | 0.01799          |
| TAKEOFF   | 1.000               | 3755.0      | 25.869                    | 2256.038              | 1.000              | 0.50                    | 0.216               | 18.80                | 11.467                | 31.29           | 0.00689          |
| CLIMBOUT  | 0.900               | 3379.5      | 22.794                    | 1953.967              | 1.000              | 2.50                    | 0.950               | 81.42                | 11.665                | 140.81          | 0.00674          |
| APPROACH  | 0.300               | 1126.5      | 7.169                     | 1002.166              | 1.000              | 4.50                    | 0.538               | 75.16                | 7.154                 | 84.49           | 0.00636          |
| TAXI-IDLE | 0.030               | 112.6       | 2.027                     | 609.222               | 1.000              | 7.00                    | 0.236               | 71.08                | 3.327                 | 13.14           | 0.01799          |

TOTAL FOR CYCLE: 2.581 439.37 305.41  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.875  
LBS POLLUTANT/1K HP-HR/CYCLE: 8.452  
LBS POLLUTANT/1000K HP AT T.O.: 57.411

DATE: 6/24/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 11 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: AE-106634

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 2779. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 29.29 FINISH 29.29

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0167

RELATIVE HUMIDITY: 76.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 10

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR ALL RUNS

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2610.00                  | 56                 | 13820.00         | -0.00                    | 1600.00                 | 0.013300 | -0.00                               | -0.00                     | 1605.00                      |
| 6.00         | 2/ 1      | 1838.00                  | 83                 | 13800.00         | -0.00                    | 2085.00                 | 0.017100 | -0.00                               | -0.00                     | 1872.00                      |
| 11.00        | 3/ 2      | 4173.00                  | 89                 | 13820.00         | -0.00                    | 2180.00                 | 0.018000 | -0.00                               | -0.00                     | 1920.00                      |
| 16.30        | 6/ 1      | 4386.00                  | 95                 | 13800.00         | -0.00                    | 2275.00                 | 0.020100 | -0.00                               | -0.00                     | 1968.00                      |
| 19.00        | 4/ 6      | 848.00                   | 18                 | 13360.00         | -0.00                    | 930.00                  | 0.008300 | -0.00                               | -0.00                     | 1212.00                      |
| 21.00        | 5/ 4      | 4452.00                  | 96                 | 13820.00         | -0.00                    | 2295.00                 | 0.020100 | -0.00                               | -0.00                     | 2035.00                      |
| 22.00        | 6/ 5      | 4320.00                  | 94                 | 13800.00         | -0.00                    | 2275.00                 | 0.020100 | -0.00                               | -0.00                     | 1970.00                      |
| 25.00        | 4/ 6      | 911.00                   | 19                 | 13350.00         | -0.00                    | 955.00                  | 0.008400 | -0.00                               | -0.00                     | 1230.00                      |
| 27.00        | 7/ 4      | 127.00                   | 2                  | 9990.00          | -0.00                    | 585.00                  | 0.012100 | -0.00                               | -0.00                     | 1238.00                      |
| 28.30        | 8/ 7      | 233.00                   | 5                  | 13350.00         | -0.00                    | 750.00                  | 0.006900 | -0.00                               | -0.00                     | 1124.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 56                       | -0.00                      | -0.00                     | 23.00         | 2.69                 | 8.00           | 61.00         | 7.00            | 68.00           | -0.00     | -0.00 | -0.00        |
| 83                       | -0.00                      | -0.00                     | 22.00         | 3.45                 | 8.00           | 93.00         | 4.00            | 97.00           | -0.00     | -0.00 | -0.00        |
| 89                       | -0.00                      | -0.00                     | 22.00         | 3.62                 | 9.00           | 93.00         | 6.00            | 99.00           | -0.00     | -0.00 | -0.00        |
| 95                       | -0.00                      | -0.00                     | 21.00         | 4.04                 | 11.00          | 102.00        | 9.00            | 111.00          | -0.00     | -0.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 29.00         | 1.67                 | 9.00           | 0.0           | 0.0             | 33.00           | -0.00     | -0.00 | -0.00        |
| 96                       | -0.00                      | -0.00                     | 21.00         | 4.04                 | 12.00          | 0.0           | 0.0             | 111.00          | -0.00     | -0.00 | -0.00        |
| 94                       | -0.00                      | -0.00                     | 21.00         | 4.04                 | 11.00          | 102.00        | 9.00            | 111.00          | -0.00     | -0.00 | -0.00        |
| 19                       | -0.00                      | -0.00                     | 29.00         | 1.70                 | 9.00           | 0.0           | 0.0             | 35.00           | -0.00     | -0.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 378.00        | 2.44                 | 185.00         | 9.00          | 19.00           | 28.00           | -0.00     | -0.00 | -0.00        |
| 5                        | -0.00                      | -0.00                     | 40.00         | 1.40                 | 18.00          | 0.0           | 0.0             | 29.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 56                       | 1.71                      | 0.34                      | 0.85                       | 3135.26                    | 7.43                      | 8.29                       | 2.73              | 0.54              | 1.36               | 5016.41            | 11.89             | 13.26              |
| 83                       | 1.27                      | 0.27                      | 0.38                       | 3136.15                    | 8.84                      | 4.72                       | 2.65              | 0.55              | 0.79               | 6538.86            | 18.43             | 19.22              |
| 89                       | 1.21                      | 0.28                      | 0.54                       | 3136.19                    | 8.42                      | 8.97                       | 2.64              | 0.62              | 1.18               | 6836.88            | 18.36             | 19.55              |
| 95                       | 1.94                      | 0.31                      | 0.73                       | 3136.39                    | 8.28                      | 9.01                       | 2.36              | 0.71              | 1.66               | 7135.29            | 18.83             | 20.49              |
| 18                       | 1.46                      | 0.62                      | 0.0                        | 3131.75                    | 0.0                       | 6.47                       | 3.22              | 0.57              | 0.0                | 2912.53            | 0.0               | 6.02               |
| 96                       | 1.04                      | 0.34                      | 0.0                        | 3136.31                    | 0.0                       | 9.01                       | 2.38              | 0.78              | 0.0                | 7197.82            | 0.0               | 20.67              |
| 94                       | 1.04                      | 0.31                      | 0.73                       | 3136.39                    | 8.28                      | 9.01                       | 2.36              | 0.71              | 1.66               | 7135.28            | 18.83             | 20.49              |
| 19                       | 3.40                      | 0.60                      | 0.0                        | 3131.87                    | 0.0                       | 6.74                       | 3.25              | 0.58              | 0.0                | 2990.94            | 0.0               | 6.44               |
| 2                        | 30.01                     | 17.51                     | 2.48                       | 3043.69                    | 1.17                      | 3.65                       | 17.56             | 10.24             | 1.45               | 1780.56            | 0.69              | 2.14               |
| 5                        | 5.68                      | 1.46                      | 0.0                        | 3125.93                    | 0.0                       | 6.77                       | 4.26              | 1.10              | 0.0                | 2344.44            | 0.0               | 5.08               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 56                       | 1.046          | 1921.996         | 0.208           | 4.556          | 0.523            | 5.079            |
| 83                       | 0.691          | 1703.716         | 0.144           | 4.801          | 0.207            | 5.008            |
| 89                       | 0.441          | 1658.230         | 0.150           | 4.453          | 0.287            | 4.741            |
| 95                       | 0.538          | 1626.830         | 0.161           | 4.294          | 0.379            | 4.673            |
| 18                       | 3.796          | 3434.584         | 0.675           | 0.0            | 0.0              | 7.095            |
| 96                       | 0.535          | 1616.762         | 0.175           | 0.0            | 0.0              | 4.644            |
| 94                       | 0.546          | 1651.685         | 0.164           | 4.359          | 0.385            | 4.744            |
| 19                       | 3.565          | 3283.139         | 0.634           | 0.0            | 0.0              | 7.066            |
| 2                        | 138.235        | 14020.164        | 80.636          | 5.406          | 11.413           | 16.819           |
| 5                        | 18.247         | 10061.988        | 4.716           | 0.0            | 0.0              | 21.789           |

CAL ID NUMBER: 11 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: S M R I KELLY

SERIAL NUMBER: AE-106634

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 30.255                    | 575.225               | 1.000              | 19.00                   | 9.581              | 182.15               | 52.598                | 43.61           | 0.21967          |
| TAKEOFF   | 1.000               | 4591.0      | 2.112                     | 2358.710              | 1.000              | 0.50                    | 0.018              | 19.66                | 0.895                 | 38.26           | 0.00046          |
| CLIMBOUT  | 0.900               | 4131.9      | 2.345                     | 2164.557              | 1.000              | 2.50                    | 0.098              | 90.19                | 1.083                 | 172.16          | 0.00057          |
| APPROACH  | 0.300               | 1377.3      | 3.149                     | 1135.413              | 1.000              | 4.50                    | 0.236              | 85.16                | 2.774                 | 103.30          | 0.00229          |
| TAXI-IDLE | 0.030               | 137.7       | 30.255                    | 575.225               | 1.000              | 7.00                    | 3.530              | 67.11                | 52.598                | 16.07           | 0.21967          |

TOTAL FOR CYCLE: 13.462 444.27 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 30.302  
LBS POLLUTANT/1K HP-HR/CYCLE: 36.053  
LBS POLLUTANT/1000K HP AT T.O.: 0.383

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 18.507                    | 575.225               | 1.000              | 19.00                   | 5.861              | 182.15               | 32.174                | 43.61           | 0.13437          |
| TAKEOFF   | 1.000               | 4591.0      | 0.557                     | 2358.710              | 1.000              | 0.50                    | 0.005              | 19.66                | 0.236                 | 38.26           | 0.00012          |
| CLIMBOUT  | 0.900               | 4131.9      | 0.511                     | 2164.557              | 1.000              | 2.50                    | 0.021              | 90.19                | 0.236                 | 172.16          | 0.00012          |
| APPROACH  | 0.300               | 1377.3      | 0.544                     | 1135.413              | 1.000              | 4.50                    | 0.041              | 85.16                | 0.479                 | 103.30          | 0.00039          |
| TAXI-IDLE | 0.030               | 137.7       | 18.507                    | 575.225               | 1.000              | 7.00                    | 2.159              | 67.11                | 32.174                | 16.07           | 0.13437          |

TOTAL FOR CYCLE: 8.086 444.27 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 18.202  
LBS POLLUTANT/1K HP-HR/CYCLE: 21.656  
LBS POLLUTANT/1000K HP AT T.O.: 1.010

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 1.660                     | 575.225               | 1.000              | 19.00                   | 0.526               | 182.15               | 2.885                 | 43.61           | 0.01205          |
| TAKEOFF   | 1.000               | 4591.0      | 21.327                    | 2358.710              | 1.000              | 0.50                    | 0.178               | 19.66                | 9.042                 | 38.26           | 0.00465          |
| CLIMBOUT  | 0.900               | 4131.9      | 19.560                    | 2164.557              | 1.000              | 2.50                    | 0.815               | 90.19                | 9.036                 | 172.16          | 0.00473          |
| APPROACH  | 0.300               | 1377.3      | 8.398                     | 1135.413              | 1.000              | 4.50                    | 0.630               | 85.16                | 7.397                 | 103.30          | 0.00610          |
| TAXI-IDLE | 0.030               | 137.7       | 1.660                     | 575.225               | 1.000              | 7.00                    | 0.194               | 67.11                | 2.885                 | 16.07           | 0.01205          |

TOTAL FOR CYCLE: 2.342 444.27 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.271  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.271  
LBS POLLUTANT/1000K HP AT T.O.: 38.712

DATE: 6/16/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA .....

CAL ID NUMBR: 18 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8506

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.90

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0096

RELATIVE HUMIDITY: 30.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 7

COMMENTS:

FINAL RUN

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 235.60             | 5                        | 13500.00         | -0.00                    | 721.00                  | 0.006700 | -0.00                               | -0.00                     | 1090.00                      |
| -0.00      | 2/ 1      | 2342.90            | 51                       | 13400.00         | -0.00                    | 1522.00                 | 0.014200 | -0.00                               | -0.00                     | 1610.00                      |
| -0.00      | 3/ 2      | 3590.90            | 78                       | 13800.00         | -0.00                    | 1925.00                 | 0.017990 | -0.00                               | -0.00                     | 1850.00                      |
| -0.00      | 5/ 3      | 4160.30            | 90                       | 13800.00         | -0.00                    | 2152.00                 | 0.020100 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 6/ 5      | 1081.50            | 23                       | 14200.00         | -0.00                    | 1058.00                 | 0.010800 | -0.00                               | -0.00                     | 1385.00                      |
| -0.00      | 7/ 6      | 829.20             | 18                       | 13200.00         | -0.00                    | 900.00                  | 0.008500 | -0.00                               | -0.00                     | 1175.00                      |
| -0.00      | 15/ 7     | 257.00             | 5                        | 13500.00         | -0.00                    | 730.00                  | 0.006800 | -0.00                               | -0.00                     | 1085.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 50.00         | 1.42                 | 40.00          | -0.00         | -0.00           | 32.00           | -0.00     | 62.00 | -0.00        |
| 51                       | -0.00                      | -0.00                     | 30.00         | 3.23                 | 13.00          | -0.00         | -0.00           | 97.00           | -0.00     | 59.00 | -0.00        |
| 78                       | -0.00                      | -0.00                     | 32.00         | 4.10                 | 2.00           | -0.00         | -0.00           | 129.00          | -0.00     | 60.00 | -0.00        |
| 90                       | -0.00                      | -0.00                     | 34.70         | 4.43                 | 2.00           | -0.00         | -0.00           | 152.00          | -0.00     | 60.00 | -0.00        |
| 23                       | -0.00                      | -0.00                     | 35.00         | 3.07                 | 3.00           | -0.00         | -0.00           | 129.00          | -0.00     | 57.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 52.00         | 2.08                 | 3.00           | -0.00         | -0.00           | 71.00           | -0.00     | 62.00 | -0.00        |
| 5                        | -0.00                      | -0.00                     | 50.00         | 1.42                 | 23.00          | -0.00         | -0.00           | 30.00           | -0.00     | 67.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 7.00                      | 3.25                      | -0.00                      | 3124.60                    | -0.00                     | 7.36                       | 5.05              | 2.35              | -0.00              | 2252.84            | -0.00             | 5.31               |
| 51                       | 1.86                      | 0.48                      | -0.00                      | 3140.30                    | -0.00                     | 9.86                       | 2.81              | 0.72              | -0.00              | 4779.54            | -0.00             | 15.01              |
| 78                       | 1.56                      | 0.06                      | -0.00                      | 3141.91                    | -0.00                     | 10.33                      | 3.00              | 0.11              | -0.00              | 6048.18            | -0.00             | 19.89              |
| 90                       | 1.53                      | 0.05                      | -0.00                      | 3141.97                    | -0.00                     | 11.27                      | 3.30              | 0.12              | -0.00              | 6761.50            | -0.00             | 24.25              |
| 23                       | 2.28                      | 0.12                      | -0.00                      | 3140.63                    | -0.00                     | 14.80                      | 2.41              | 0.12              | -0.00              | 3322.78            | -0.00             | 14.60              |
| 18                       | 4.74                      | 0.17                      | -0.00                      | 3136.22                    | -0.00                     | 11.19                      | 4.49              | 0.15              | -0.00              | 2822.60            | -0.00             | 10.07              |
| 5                        | 7.01                      | 1.87                      | -0.00                      | 3128.37                    | -0.00                     | 6.91                       | 5.12              | 1.37              | -0.00              | 2283.71            | -0.00             | 5.04               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 21.479         | 9542.121         | 9.956           | -0.000         | -0.000           | 22.527           |
| 51                       | 1.206          | 2040.010         | 0.309           | -0.000         | -0.000           | 6.404            |
| 78                       | 0.937          | 1684.308         | 0.031           | -0.000         | -0.000           | 5.540            |
| 90                       | 0.794          | 1625.246         | 0.028           | -0.000         | -0.000           | 5.830            |
| 23                       | 2.729          | 3072.385         | 0.113           | -0.000         | -0.000           | 13.496           |
| 18                       | 5.116          | 3404.004         | 0.183           | -0.000         | -0.000           | 12.147           |
| 5                        | 19.914         | 8886.035         | 5.370           | -0.000         | -0.000           | 19.626           |

CAL ID NUMBER: 18 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8906  
 TEST ORGANIZATION: ALLISON DIVISION

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.030               | 137.7       | 2.987                     | 406.335               | 1.000              | 19.00                   | 0.946              | 128.67               | 7.351                 | 43.61           | 0.02169          |
| TAKEOFF                         | 1.000               | 4591.0      | 3.867                     | 2334.892              | 1.000              | 0.50                    | 0.032              | 19.46                | 1.656                 | 38.26           | 0.00084          |
| CLIMBOUT                        | 0.900               | 4131.9      | 3.535                     | 2134.571              | 1.000              | 2.50                    | 0.147              | 88.94                | 1.656                 | 172.16          | 0.00084          |
| APPROACH                        | 0.300               | 1377.3      | 2.604                     | 1184.325              | 1.000              | 4.50                    | 0.195              | 88.82                | 2.198                 | 103.30          | 0.00189          |
| TAXI-IDLE                       | 0.030               | 137.7       | 2.987                     | 406.335               | 1.000              | 7.00                    | 0.348              | 47.41                | 7.351                 | 16.07           | 0.02169          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 1.669              | 373.30               |                       | 373.40          |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 4.471              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 4.470              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.702              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.030               | 137.7       | 6.425                     | 406.335               | 1.000              | 19.00                   | 2.035              | 128.67               | 15.813                | 43.61           | 0.04665          |
| TAKEOFF                         | 1.000               | 4591.0      | 0.044                     | 2334.892              | 1.000              | 0.50                    | 0.000              | 19.46                | 0.019                 | 38.26           | 0.00001          |
| CLIMBOUT                        | 0.900               | 4131.9      | 0.058                     | 2134.571              | 1.000              | 2.50                    | 0.002              | 88.94                | 0.027                 | 172.16          | 0.00001          |
| APPROACH                        | 0.300               | 1377.3      | 0.095                     | 1184.325              | 1.000              | 4.50                    | 0.007              | 88.82                | 0.080                 | 103.30          | 0.00007          |
| TAXI-IDLE                       | 0.030               | 137.7       | 6.425                     | 406.335               | 1.000              | 7.00                    | 0.750              | 47.41                | 15.813                | 16.07           | 0.04665          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 2.794              | 373.30               |                       | 373.40          |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 7.485              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 7.483              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.081              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.030               | 137.7       | 1.633                     | 406.335               | 1.000              | 19.00                   | 0.517               | 128.67               | 4.020                 | 43.61           | 0.01186          |
| TAKEOFF                         | 1.000               | 4591.0      | 30.075                    | 2334.892              | 1.000              | 0.50                    | 0.251               | 19.46                | 12.881                | 38.26           | 0.00655          |
| CLIMBOUT                        | 0.900               | 4131.9      | 23.783                    | 2134.571              | 1.000              | 2.50                    | 0.991               | 88.94                | 11.142                | 172.16          | 0.00576          |
| APPROACH                        | 0.300               | 1377.3      | 10.357                    | 1184.325              | 1.000              | 4.50                    | 0.777               | 88.82                | 8.745                 | 103.30          | 0.00752          |
| TAXI-IDLE                       | 0.030               | 137.7       | 1.633                     | 406.335               | 1.000              | 7.00                    | 0.191               | 47.41                | 4.020                 | 16.07           | 0.01186          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 2.726               | 373.30               |                       | 373.40          |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 7.303               |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 7.301               |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 54.591              |                      |                       |                 |                  |

DATE: 6/23/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 19 ENGINE TYPE AND MODEL: T56-A15

SERIAL NUMBER: 8509

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGR F: START 90.00 FINISH 91.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.90

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0094

RELATIVE HUMIDITY: 29.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

FINAL RUN

| CLOCK TIME | TEST MODE | THRUST, LBS OR SMP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 | ENGINE SPEED RPM N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGR F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGR F |
|------------|-----------|--------------------|--------------------------|---------------------|---------------------|--------------------------|-------------------------|----------|----------------------------------|---------------------------|---------------------------|
| -0.00      | 1/ 0      | 235.60             | 5                        | 13500.00            | -0.00               | 718.00                   | 29.73                   | 0.006700 | -0.00                            | -0.00                     | 990.00                    |
| -0.00      | 2/ 1      | 2539.90            | 55                       | 13800.00            | -0.00               | 1544.00                  | -0.00                   | 0.014400 | -0.00                            | -0.00                     | 1610.00                   |
| -0.00      | 3/ 2      | 3591.00            | 79                       | 13800.00            | -0.00               | 1940.00                  | 29.62                   | 0.018200 | -0.00                            | -0.00                     | 1850.00                   |
| -0.00      | 4/ 3      | 3853.70            | 83                       | 13800.00            | -0.00               | 2045.00                  | 29.72                   | 0.019100 | -0.00                            | -0.00                     | 1920.00                   |
| -0.00      | 5/ 4      | 4335.40            | 94                       | 13800.00            | -0.00               | 2128.00                  | 29.65                   | 0.019900 | -0.00                            | -0.00                     | 1970.00                   |
| -0.00      | 7/ 5      | 829.20             | 18                       | 13400.00            | -0.00               | 908.00                   | 29.48                   | 0.008600 | -0.00                            | -0.00                     | 1250.00                   |
| -0.00      | 9/ 7      | 4116.50            | 89                       | 13800.00            | -0.00               | 2150.00                  | 29.58                   | 0.020200 | -0.00                            | -0.00                     | 1970.00                   |
| -0.00      | 14/ 9     | 95.20              | 2                        | 10000.00            | -0.00               | 572.00                   | 20.08                   | 0.003800 | -0.00                            | -0.00                     | 1205.00                   |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGR F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                   | -0.00                     | 52.00         | 1.70                 | 32.00          | -0.00         | -0.00           | 46.00           | -0.00     | 52.00 | -0.00        |
| 55                       | -0.00                   | -0.00                     | 37.00         | 3.46                 | 5.00           | -0.00         | -0.00           | 107.00          | -0.00     | 53.00 | -0.00        |
| 78                       | -0.00                   | -0.00                     | 37.00         | 4.42                 | 3.00           | -0.00         | -0.00           | 142.00          | -0.00     | 53.00 | -0.00        |
| 83                       | -0.00                   | -0.00                     | 35.00         | 4.55                 | 2.00           | -0.00         | -0.00           | 145.00          | -0.00     | 53.00 | -0.00        |
| 94                       | -0.00                   | -0.00                     | 35.00         | 4.70                 | 3.00           | -0.00         | -0.00           | 150.00          | -0.00     | 53.00 | -0.00        |
| 18                       | -0.00                   | -0.00                     | 37.00         | 2.18                 | 8.00           | -0.00         | -0.00           | 32.00           | -0.00     | 54.00 | -0.00        |
| 89                       | -0.00                   | -0.00                     | 35.00         | 4.90                 | 3.00           | -0.00         | -0.00           | 150.00          | -0.00     | 53.00 | -0.00        |
| 2                        | -0.00                   | -0.00                     | 450.00        | 3.08                 | 380.00         | -0.00         | -0.00           | 29.00           | -0.00     | 41.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 6.09                      | 2.18                      | -0.00                      | 3128.97                    | -0.00                     | 8.85                       | 4.17              | 1.57              | -0.00              | 2246.60            | -0.00             | 6.36               |
| 55                       | 2.14                      | 0.17                      | -0.00                      | 3140.70                    | -0.00                     | 9.68                       | 3.30              | 0.26              | -0.00              | 4849.23            | -0.00             | 14.94              |
| 78                       | 1.67                      | 0.08                      | -0.00                      | 3141.67                    | -0.00                     | 10.55                      | 3.25              | 0.16              | -0.00              | 6094.86            | -0.00             | 20.47              |
| 83                       | 1.54                      | 0.05                      | -0.00                      | 3141.96                    | -0.00                     | 10.47                      | 3.15              | 0.11              | -0.00              | 6425.31            | -0.00             | 21.41              |
| 94                       | 1.49                      | 0.08                      | -0.00                      | 3141.97                    | -0.00                     | 10.48                      | 3.17              | 0.16              | -0.00              | 6686.12            | -0.00             | 22.31              |
| 18                       | 3.39                      | 0.43                      | -0.00                      | 3138.02                    | -0.00                     | 4.82                       | 3.08              | 0.39              | -0.00              | 2849.33            | -0.00             | 4.37               |
| 89                       | 1.43                      | 0.07                      | -0.00                      | 3142.08                    | -0.00                     | 10.05                      | 3.07              | 0.16              | -0.00              | 6755.46            | -0.00             | 21.67              |
| 2                        | 28.46                     | 14.19                     | -0.00                      | 3060.88                    | -0.00                     | 3.01                       | 16.28             | 8.12              | -0.00              | 1750.82            | -0.00             | 1.72               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 18.564         | 9535.641         | 6.653           | -0.000         | -0.000           | 26.974           |
| 55                       | 1.299          | 1909.223         | 0.104           | -0.000         | -0.000           | 5.884            |
| 78                       | 0.904          | 1697.255         | 0.044           | -0.000         | -0.000           | 5.700            |
| 83                       | 0.816          | 1667.309         | 0.028           | -0.000         | -0.000           | 5.555            |
| 94                       | 0.731          | 1542.215         | 0.038           | -0.000         | -0.000           | 5.145            |
| 18                       | 3.712          | 3436.234         | 0.470           | -0.000         | -0.000           | 5.273            |
| 89                       | 0.746          | 1641.070         | 0.038           | -0.000         | -0.000           | 5.252            |
| 2                        | 171.013        | 18391.090        | 85.253          | -0.000         | -0.000           | 18.102           |

CAL ID NUMBER: 19 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8509

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 4.170                     | 463.900               | 1.000              | 19.00                   | 1.320              | 146.90               | 8.988                 | 43.61           | 0.03027          |
| TAKEOFF   | 1.000               | 4591.0      | 2.874                     | 2242.194              | 1.000              | 0.50                    | 0.024              | 18.68                | 1.282                 | 38.26           | 0.00063          |
| CLIMBOUT  | 0.900               | 4131.9      | 2.806                     | 2105.092              | 1.000              | 2.50                    | 0.117              | 87.71                | 1.333                 | 172.16          | 0.00068          |
| APPROACH  | 0.300               | 1377.3      | 3.122                     | 1106.484              | 1.000              | 4.50                    | 0.234              | 82.99                | 2.822                 | 103.30          | 0.00227          |
| TAXI-IDLE | 0.030               | 137.7       | 4.170                     | 463.900               | 1.000              | 7.00                    | 0.486              | 54.12                | 8.988                 | 16.07           | 0.03027          |

TOTAL FOR CYCLE: 2.182 390.41 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.589  
LBS POLLUTANT/1K HP-HR/CYCLE: 5.843  
LBS POLLUTANT/1000K HP AT T.O.: 0.522

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 6.147                     | 463.900               | 1.000              | 19.00                   | 1.946              | 146.90               | 13.250                | 43.61           | 0.04463          |
| TAKEOFF   | 1.000               | 4591.0      | 0.0                       | 2242.194              | 1.000              | 0.50                    | 0.0                | 18.68                | 0.0                   | 38.26           | 0.0              |
| CLIMBOUT  | 0.900               | 4131.9      | 0.001                     | 2105.092              | 1.000              | 2.50                    | 0.000              | 87.71                | 0.001                 | 172.16          | 0.00000          |
| APPROACH  | 0.300               | 1377.3      | 0.360                     | 1106.484              | 1.000              | 4.50                    | 0.027              | 82.99                | 0.325                 | 103.30          | 0.00026          |
| TAXI-IDLE | 0.030               | 137.7       | 6.147                     | 463.900               | 1.000              | 7.00                    | 0.717              | 54.12                | 13.250                | 16.07           | 0.04463          |

TOTAL FOR CYCLE: 2.691 390.41 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.892  
LBS POLLUTANT/1K HP-HR/CYCLE: 7.206  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 1.412                     | 463.900               | 1.000              | 19.00                   | 0.447               | 146.90               | 3.045                 | 43.61           | 0.01026          |
| TAKEOFF   | 1.000               | 4591.0      | 23.554                    | 2242.194              | 1.000              | 0.50                    | 0.196               | 18.68                | 10.505                | 38.26           | 0.00513          |
| CLIMBOUT  | 0.900               | 4131.9      | 22.167                    | 2105.092              | 1.000              | 2.50                    | 0.924               | 87.71                | 10.530                | 172.16          | 0.00536          |
| APPROACH  | 0.300               | 1377.3      | 7.015                     | 1106.484              | 1.000              | 4.50                    | 0.526               | 82.99                | 6.340                 | 103.30          | 0.00509          |
| TAXI-IDLE | 0.030               | 137.7       | 1.412                     | 463.900               | 1.000              | 7.00                    | 0.165               | 54.12                | 3.045                 | 16.07           | 0.01026          |

TOTAL FOR CYCLE: 2.258 390.41 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.784  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.047  
LBS POLLUTANT/1000K HP AT T.O.: 42.754

DATE: 6/28/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA .....

CAL ID NUMBER: 20 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8516

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MGT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 28.80 FINISH 29.10

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0115

RELATIVE HUMIDITY: 47.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 9

COMMENTS:

GREEN RUN

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2    | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|--------------------|------------------|---------|-------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 2/ 0      | 212.60             | 4                        | 13400.00           | -0.00            | 714.00  | 30.39 | 0.006500                 | -0.00                   | -0.00    | 1070.00                             |                           |                              |
| -0.00      | 3/ 2      | 2605.60            | 56                       | 13800.00           | -0.00            | 1575.00 | 30.96 | 0.014100                 | -0.00                   | -0.00    | 1610.00                             |                           |                              |
| -0.00      | 4/ 3      | 3478.50            | 80                       | 13800.00           | -0.00            | 1970.00 | 30.75 | 0.017800                 | -0.00                   | -0.00    | 1850.00                             |                           |                              |
| -0.00      | 18/ 4     | 257.00             | 5                        | 13500.00           | -0.00            | 753.00  | 30.78 | 0.006800                 | -0.00                   | -0.00    | 1075.00                             |                           |                              |
| -0.00      | 10/18     | 4313.50            | 93                       | 13800.00           | -0.00            | 2190.00 | 30.78 | 0.019800                 | -0.00                   | -0.00    | 1970.00                             |                           |                              |
| -0.00      | 12/10     | 807.90             | 17                       | 13400.00           | -0.00            | 896.00  | 30.68 | 0.008100                 | -0.00                   | -0.00    | 1195.00                             |                           |                              |
| -0.00      | 6/12      | 4204.00            | 91                       | 13800.00           | -0.00            | 2175.00 | 30.78 | 0.019600                 | -0.00                   | -0.00    | 1970.00                             |                           |                              |
| -0.00      | 8/ 6      | 807.90             | 17                       | 13400.00           | -0.00            | 900.00  | 30.61 | 0.008200                 | -0.00                   | -0.00    | 1195.00                             |                           |                              |
| -0.00      | 17/ 8     | 95.20              | 2                        | 10000.00           | -0.00            | 560.00  | 20.16 | 0.007700                 | -0.00                   | -0.00    | 1180.00                             |                           |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WFT) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | -0.00                      | -0.00                     | 63.00         | 1.51                 | 7.00           | -0.00         | -0.00           | 24.00           | -0.00     | 50.00 | -0.00        |
| 56                       | -0.00                      | -0.00                     | 34.00         | 3.30                 | 3.00           | -0.00         | -0.00           | 88.00           | -0.00     | 56.00 | -0.00        |
| 80                       | -0.00                      | -0.00                     | 36.00         | 4.10                 | 3.00           | -0.00         | -0.00           | 115.00          | -0.00     | 58.00 | -0.00        |
| 5                        | -0.00                      | -0.00                     | 63.00         | 1.51                 | 7.00           | -0.00         | -0.00           | 24.00           | -0.00     | 50.00 | -0.00        |
| 93                       | -0.00                      | -0.00                     | 43.00         | 4.40                 | 3.00           | -0.00         | -0.00           | 164.00          | -0.00     | 56.00 | -0.00        |
| 17                       | -0.00                      | -0.00                     | 58.00         | 2.10                 | 3.00           | -0.00         | -0.00           | 42.00           | -0.00     | 54.00 | -0.00        |
| 91                       | -0.00                      | -0.00                     | 40.00         | 4.40                 | 3.00           | -0.00         | -0.00           | 138.00          | -0.00     | 56.00 | -0.00        |
| 17                       | -0.00                      | -0.00                     | 57.00         | 2.05                 | 3.00           | -0.00         | -0.00           | 28.00           | -0.00     | 54.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 375.00        | 2.50                 | 370.00         | -0.00         | -0.00           | 6.00            | -0.00     | 42.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 8.31                      | 0.54                      | -0.00                      | 3129.99                    | -0.00                     | 5.20                       | 5.93              | 0.38              | -0.00              | 2234.82            | -0.00             | 3.71               |
| 56                       | 2.06                      | 0.11                      | -0.00                      | 3140.99                    | -0.00                     | 8.76                       | 3.24              | 0.17              | -0.00              | 4947.06            | -0.00             | 13.79              |
| 80                       | 1.76                      | 0.09                      | -0.00                      | 3141.53                    | -0.00                     | 9.21                       | 3.46              | 0.17              | -0.00              | 6188.80            | -0.00             | 18.15              |
| 5                        | 8.31                      | 0.54                      | -0.00                      | 3129.99                    | -0.00                     | 5.20                       | 6.26              | 0.40              | -0.00              | 2356.89            | -0.00             | 3.92               |
| 93                       | 1.95                      | 0.08                      | -0.00                      | 3141.23                    | -0.00                     | 12.24                      | 4.28              | 0.18              | -0.00              | 6879.29            | -0.00             | 26.81              |
| 17                       | 5.51                      | 0.17                      | -0.00                      | 3135.41                    | -0.00                     | 6.56                       | 4.94              | 0.15              | -0.00              | 2809.33            | -0.00             | 5.87               |
| 91                       | 1.82                      | 0.08                      | -0.00                      | 3141.45                    | -0.00                     | 10.30                      | 3.95              | 0.18              | -0.00              | 6832.64            | -0.00             | 22.40              |
| 17                       | 5.55                      | 0.17                      | -0.00                      | 3135.34                    | -0.00                     | 4.48                       | 4.99              | 0.15              | -0.00              | 2821.81            | -0.00             | 4.03               |
| 2                        | 29.14                     | 16.88                     | -0.00                      | 3052.43                    | -0.00                     | 0.77                       | 16.32             | 9.45              | -0.00              | 1709.36            | -0.00             | 0.43               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 27.913         | 17511.832        | 1.803           | -0.000         | -0.000           | 17.466           |
| 56                       | 1.245          | 1898.627         | 0.065           | -0.000         | -0.000           | 5.293            |
| 80                       | 0.940          | 1642.427         | 0.047           | -0.000         | -0.000           | 4.933            |
| 5                        | 24.152         | 9170.758         | 1.573           | -0.000         | -0.000           | 15.238           |
| 93                       | 0.992          | 1594.879         | 0.041           | -0.000         | -0.000           | 6.214            |
| 17                       | 6.112          | 3477.320         | 0.185           | -0.000         | -0.000           | 7.270            |
| 91                       | 0.940          | 1625.271         | 0.042           | -0.000         | -0.000           | 5.329            |
| 17                       | 6.181          | 3492.766         | 0.190           | -0.000         | -0.000           | 4.987            |
| 2                        | 171.416        | 17955.504        | 99.286          | -0.000         | -0.000           | 4.505            |

CAL ID NUMBER: 20 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8516

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 10.176                    | 612.968               | 1.000              | 19.00                   | 3.222              | 194.11               | 16.601                | 43.61           | 0.07388          |
| TAKEOFF   | 1.000               | 4591.0      | 4.573                     | 2280.831              | 1.000              | 0.50                    | 0.038              | 19.01                | 2.005                 | 38.26           | 0.00100          |
| CLIMBOUT  | 0.900               | 4131.9      | 3.602                     | 2133.054              | 1.000              | 2.50                    | 0.150              | 88.88                | 1.689                 | 172.16          | 0.00087          |
| APPROACH  | 0.300               | 1377.3      | 4.281                     | 1138.158              | 1.000              | 4.50                    | 0.321              | 85.36                | 3.761                 | 103.30          | 0.00311          |
| TAXI-IDLE | 0.030               | 137.7       | 10.176                    | 612.968               | 1.000              | 7.00                    | 1.187              | 71.51                | 16.601                | 16.07           | 0.07388          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.919  
LBS POLLUTANT/1K HP-HR/CYCLE: 10.720  
LBS POLLUTANT/1000K HP AT T.O.: 13.173  
LBS POLLUTANT/1000K HP AT T.O.: 0.830

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 13.048                    | 612.968               | 1.000              | 19.00                   | 4.132              | 194.11               | 21.287                | 43.61           | 0.09474          |
| TAKEOFF   | 1.000               | 4591.0      | 0.091                     | 2280.831              | 1.000              | 0.50                    | 0.001              | 19.01                | 0.040                 | 38.26           | 0.00002          |
| CLIMBOUT  | 0.900               | 4131.9      | 0.085                     | 2133.054              | 1.000              | 2.50                    | 0.004              | 88.88                | 0.040                 | 172.16          | 0.00002          |
| APPROACH  | 0.300               | 1377.3      | 0.052                     | 1138.158              | 1.000              | 4.50                    | 0.004              | 85.36                | 0.046                 | 103.30          | 0.00004          |
| TAXI-IDLE | 0.030               | 137.7       | 13.048                    | 612.968               | 1.000              | 7.00                    | 1.522              | 71.51                | 21.287                | 16.07           | 0.09474          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.662  
LBS POLLUTANT/1K HP-HR/CYCLE: 12.340  
LBS POLLUTANT/1000K HP AT T.O.: 15.164  
LBS POLLUTANT/1000K HP AT T.O.: 0.166

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 0.611                     | 612.968               | 1.000              | 19.00                   | 0.194               | 194.11               | 0.997                 | 43.61           | 0.00444          |
| TAKEOFF   | 1.000               | 4591.0      | 28.681                    | 2280.831              | 1.000              | 0.50                    | 0.239               | 19.01                | 12.575                | 38.26           | 0.00625          |
| CLIMBOUT  | 0.900               | 4131.9      | 25.520                    | 2133.054              | 1.000              | 2.50                    | 1.063               | 88.88                | 11.964                | 172.16          | 0.00618          |
| APPROACH  | 0.300               | 1377.3      | 6.487                     | 1138.158              | 1.000              | 4.50                    | 0.487               | 85.36                | 5.700                 | 103.30          | 0.00471          |
| TAXI-IDLE | 0.030               | 137.7       | 0.611                     | 612.968               | 1.000              | 7.00                    | 0.071               | 71.51                | 0.997                 | 16.07           | 0.00444          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.054  
LBS POLLUTANT/1K HP-HR/CYCLE: 4.476  
LBS POLLUTANT/1000K HP AT T.O.: 5.500  
LBS POLLUTANT/1000K HP AT T.O.: 52.061

DATE: 6/29/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 21 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: R518

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0140

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 11

COMMENTS:

GREEN RUN

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1    | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|-------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 7/ 0      | 235.60                   | 5                  | 13500.00         | -0.00 | 731.00  | 29.94                    | 0.006800                | -0.00    | -0.00                               | 1065.00                   |                              |
| -0.00      | 3/ 2      | 2671.30                  | 58                 | 13800.00         | -0.00 | 1589.00 | 29.93                    | 0.014700                | -0.00    | -0.00                               | 1610.00                   |                              |
| -0.00      | 4/ 3      | 3678.50                  | 80                 | 13800.00         | -0.00 | 1980.00 | 30.00                    | 0.018300                | -0.00    | -0.00                               | 1850.00                   |                              |
| -0.00      | 5/ 4      | 3985.10                  | 86                 | 13800.00         | -0.00 | 2118.00 | 29.97                    | 0.017600                | -0.00    | -0.00                               | 1920.00                   |                              |
| -0.00      | 10/ 5     | 4269.70                  | 93                 | 13800.00         | -0.00 | 2260.00 | 29.97                    | 0.020900                | -0.00    | -0.00                               | 1970.00                   |                              |
| -0.00      | 12/10     | 765.40                   | 16                 | 13400.00         | -0.00 | 890.00  | 30.21                    | 0.008700                | -0.00    | -0.00                               | 1165.00                   |                              |
| -0.00      | 6/12      | 4247.80                  | 92                 | 13800.00         | -0.00 | 2241.00 | 29.97                    | 0.020800                | -0.00    | -0.00                               | 1970.00                   |                              |
| -0.00      | 8/ 6      | 765.40                   | 16                 | 13400.00         | -0.00 | 889.00  | 30.14                    | 0.009200                | -0.00    | -0.00                               | 1165.00                   |                              |
| -0.00      | 14/ 8     | 4247.80                  | 92                 | 13800.00         | -0.00 | 2258.00 | 30.04                    | 0.020900                | -0.00    | -0.00                               | 1970.00                   |                              |
| 8.00       | 17/14     | 95.20                    | 2                  | 10000.00         | -0.00 | 560.00  | 20.14                    | 0.007700                | -0.00    | -0.00                               | 1160.00                   |                              |
| -0.00      | 18/17     | 235.60                   | 5                  | 13500.00         | -0.00 | 742.00  | 30.32                    | 0.006800                | -0.00    | -0.00                               | 1050.00                   |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 59.00         | 7.55                 | 3.00           | -0.00         | -0.00           | 40.00           | -0.00     | 52.00 | -0.00        |
| 58                       | -0.00                      | -0.00                     | 34.00         | 1.43                 | 3.00           | -0.00         | -0.00           | 68.00           | -0.00     | 54.00 | -0.00        |
| 80                       | -0.00                      | -0.00                     | 34.00         | 4.32                 | 15.00          | -0.00         | -0.00           | 114.00          | -0.00     | 55.00 | -0.00        |
| 86                       | -0.00                      | -0.00                     | 36.00         | 4.53                 | 14.00          | -0.00         | -0.00           | 116.00          | -0.00     | 56.00 | -0.00        |
| 93                       | -0.00                      | -0.00                     | 50.00         | 4.70                 | 10.00          | -0.00         | -0.00           | 118.00          | -0.00     | 56.00 | -0.00        |
| 16                       | -0.00                      | -0.00                     | 54.00         | 2.18                 | 10.00          | -0.00         | -0.00           | 40.00           | -0.00     | 54.00 | -0.00        |
| 92                       | -0.00                      | -0.00                     | 39.00         | 4.70                 | 15.00          | -0.00         | -0.00           | 114.00          | -0.00     | 56.00 | -0.00        |
| 16                       | -0.00                      | -0.00                     | 54.00         | 2.15                 | 10.00          | -0.00         | -0.00           | 38.00           | -0.00     | 54.00 | -0.00        |
| 92                       | -0.00                      | -0.00                     | 39.00         | 4.70                 | 5.00           | -0.00         | -0.00           | 112.00          | -0.00     | 56.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 355.00        | 2.70                 | 190.00         | -0.00         | -0.00           | 30.00           | -0.00     | 42.00 | -0.00        |
| 5                        | -0.00                      | -0.00                     | 59.00         | 1.55                 | 3.00           | -0.00         | -0.00           | 14.00           | -0.00     | 52.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 1.56                      | 0.05                      | -0.00                      | 3141.93                    | -0.00                     | 1.74                       | 1.14              | 0.04              | -0.00              | 2296.75            | -0.00             | 1.27               |
| 58                       | 1.99                      | 0.10                      | -0.00                      | 3141.13                    | -0.00                     | 6.51                       | 3.15              | 0.16              | -0.00              | 4991.25            | -0.00             | 10.34              |
| 80                       | 1.57                      | 0.41                      | -0.00                      | 3140.92                    | -0.00                     | 8.66                       | 3.12              | 0.82              | -0.00              | 6219.01            | -0.00             | 17.16              |
| 86                       | 1.59                      | 0.37                      | -0.00                      | 3141.01                    | -0.00                     | 8.41                       | 3.36              | 0.78              | -0.00              | 6652.66            | -0.00             | 17.81              |
| 93                       | 2.13                      | 0.25                      | -0.00                      | 3140.48                    | -0.00                     | 8.24                       | 4.81              | 0.58              | -0.00              | 7097.49            | -0.00             | 18.63              |
| 16                       | 4.94                      | 0.54                      | -0.00                      | 3135.29                    | -0.00                     | 6.01                       | 4.40              | 0.48              | -0.00              | 2790.41            | -0.00             | 5.35               |
| 92                       | 1.66                      | 0.38                      | -0.00                      | 3140.87                    | -0.00                     | 7.96                       | 3.72              | 0.86              | -0.00              | 7038.68            | -0.00             | 17.85              |
| 16                       | 5.01                      | 0.54                      | -0.00                      | 3135.16                    | -0.00                     | 5.79                       | 4.46              | 0.48              | -0.00              | 2787.16            | -0.00             | 5.15               |
| 92                       | 1.66                      | 0.13                      | -0.00                      | 3141.57                    | -0.00                     | 7.83                       | 3.75              | 0.29              | -0.00              | 7093.66            | -0.00             | 17.67              |
| 2                        | 25.40                     | 16.54                     | -0.00                      | 3058.93                    | -0.00                     | 3.55                       | 14.33             | 9.26              | -0.00              | 1713.00            | -0.00             | 1.99               |
| 5                        | 7.59                      | 0.22                      | -0.00                      | 3131.99                    | -0.00                     | 2.96                       | 5.63              | 0.17              | -0.00              | 2323.93            | -0.00             | 2.19               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 4.849          | 9748.527         | 0.152           | -0.000         | -0.000           | 5.399            |
| 58                       | 1.179          | 1868.473         | 0.062           | -0.000         | -0.000           | 3.872            |
| 80                       | 0.947          | 1690.637         | 0.273           | -0.000         | -0.000           | 4.644            |
| 86                       | 0.944          | 1669.385         | 0.196           | -0.000         | -0.000           | 4.469            |
| 93                       | 1.125          | 1662.293         | 0.135           | -0.000         | -0.000           | 4.363            |
| 16                       | 5.747          | 3645.685         | 0.623           | -0.000         | -0.000           | 6.993            |
| 92                       | 0.375          | 1657.020         | 0.202           | -0.000         | -0.000           | 4.202            |
| 16                       | 5.921          | 3641.440         | 0.630           | -0.000         | -0.000           | 6.728            |
| 92                       | 0.882          | 1669.961         | 0.068           | -0.000         | -0.000           | 4.160            |
| 2                        | 150.573        | 17993.715        | 97.292          | -0.000         | -0.000           | 20.901           |
| 5                        | 23.496         | 9863.898         | 0.707           | -0.000         | -0.000           | 9.314            |

CAL ID NUMBER: 21 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8518

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 7.255                     | 246.359               | 1.000              | 19.00                   | 2.297              | 78.01                | 29.448                | 43.61           | 0.05267          |
| TAKEOFF   | 1.000               | 4591.0      | 3.981                     | 2428.125              | 1.000              | 0.50                    | 0.033              | 20.23                | 1.640                 | 38.26           | 0.00087          |
| CLIMBOUT  | 0.900               | 4131.9      | 3.320                     | 2193.454              | 1.000              | 2.50                    | 0.138              | 91.39                | 1.514                 | 172.16          | 0.00080          |
| APPROACH  | 0.300               | 1377.3      | 3.750                     | 1128.447              | 1.000              | 4.50                    | 0.281              | 84.63                | 3.323                 | 103.30          | 0.00272          |
| TAXI-IDLE | 0.030               | 137.7       | 7.255                     | 246.359               | 1.000              | 7.00                    | 0.846              | 28.74                | 29.448                | 16.07           | 0.05267          |

TOTAL FOR CYCLE: 3.546 303.02 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 11.869  
LBS POLLUTANT/1K HP-HR/CYCLE: 9.632  
LBS POLLUTANT/1000K HP AT T.O.: 0.723

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 4.540                     | 246.359               | 1.000              | 19.00                   | 1.438              | 78.01                | 18.429                | 43.61           | 0.03296          |
| TAKEOFF   | 1.000               | 4591.0      | 0.756                     | 2428.125              | 1.000              | 0.50                    | 0.006              | 20.23                | 0.311                 | 38.26           | 0.00016          |
| CLIMBOUT  | 0.900               | 4131.9      | 0.611                     | 2193.454              | 1.000              | 2.50                    | 0.025              | 91.39                | 0.278                 | 172.16          | 0.00015          |
| APPROACH  | 0.300               | 1377.3      | 0.361                     | 1128.447              | 1.000              | 4.50                    | 0.027              | 84.63                | 0.320                 | 103.30          | 0.00026          |
| TAXI-IDLE | 0.030               | 137.7       | 4.540                     | 246.359               | 1.000              | 7.00                    | 0.530              | 28.74                | 18.429                | 16.07           | 0.03296          |

TOTAL FOR CYCLE: 2.026 303.02 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.687  
LBS POLLUTANT/1K HP-HR/CYCLE: 5.426  
LBS POLLUTANT/1000K HP AT T.O.: 1.372

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 0.390                     | 246.359               | 1.000              | 19.00                   | 0.124               | 78.01                | 1.585                 | 43.61           | 0.00283          |
| TAKEOFF   | 1.000               | 4591.0      | 21.488                    | 2428.125              | 1.000              | 0.50                    | 0.179               | 20.23                | 8.850                 | 38.26           | 0.00468          |
| CLIMBOUT  | 0.900               | 4131.9      | 18.556                    | 2193.454              | 1.000              | 2.50                    | 0.773               | 91.39                | 8.460                 | 172.16          | 0.00449          |
| APPROACH  | 0.300               | 1377.3      | 4.875                     | 1128.447              | 1.000              | 4.50                    | 0.366               | 84.63                | 4.320                 | 103.30          | 0.00354          |
| TAXI-IDLE | 0.030               | 137.7       | 0.390                     | 246.359               | 1.000              | 7.00                    | 0.046               | 28.74                | 1.585                 | 16.07           | 0.00283          |

TOTAL FOR CYCLE: 1.487 303.02 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.907  
LBS POLLUTANT/1K HP-HR/CYCLE: 3.982  
LBS POLLUTANT/1000K HP AT T.O.: 39.004

DATE: 6/25/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 22 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8512

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 98.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0155

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

GREEN RUN

| CLOCK TIME | TEST MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|--------------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| -0.00      | 2/ 0      | 235.60                   | 5                                 | 13500.00                        | -0.00                             | 714.00                        | 29.62       | 0.006700                                     | -0.00                              | 1040.00                               |
| -0.00      | 3/ 2      | 2539.90                  | 55                                | 13800.00                        | -0.00                             | 1530.00                       | 29.35       | 0.014507                                     | -0.00                              | 1610.00                               |
| -0.00      | 4/ 1      | 3503.30                  | 76                                | 13800.00                        | -0.00                             | 1900.00                       | 29.31       | 0.018000                                     | -0.00                              | 1850.00                               |
| -0.00      | 18/ 4     | 235.60                   | 5                                 | 13500.00                        | -0.00                             | 712.00                        | 29.42       | 0.006700                                     | -0.00                              | 1080.00                               |
| -0.00      | 10/18     | 3985.10                  | 86                                | 13800.00                        | -0.00                             | 2110.00                       | 29.17       | 0.020100                                     | -0.00                              | 1970.00                               |
| -0.00      | 12/10     | 807.90                   | 17                                | 13400.00                        | -0.00                             | 881.00                        | 29.42       | 0.008300                                     | -0.00                              | 1205.00                               |
| -0.00      | 6/12      | 3985.10                  | 86                                | 13800.00                        | -0.00                             | 2110.00                       | 29.17       | 0.020100                                     | -0.00                              | 1970.00                               |
| -0.00      | 8/ 6      | 786.60                   | 17                                | 13400.00                        | -0.00                             | 872.00                        | 29.42       | 0.008200                                     | -0.00                              | 1205.00                               |
| -0.00      | 14/ 8     | 3985.10                  | 86                                | 13800.00                        | -0.00                             | 2110.00                       | 29.17       | 0.020100                                     | -0.00                              | 1970.00                               |
| -0.00      | 17/14     | 95.20                    | 2                                 | 10000.00                        | -0.00                             | 554.00                        | 20.09       | 0.007700                                     | -0.00                              | 1200.00                               |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>?<br>(DRY)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>?<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 5                                 | -0.00                               | -0.00                              | 64.00               | 1.35                          | 3.00                 | -0.00               | -0.00                    | 37.00                    | -0.00     | 50.00 | -0.00        |
| 55                                | -0.00                               | -0.00                              | 34.00               | 3.03                          | 3.00                 | -0.00               | -0.00                    | 91.00                    | -0.00     | 54.00 | -0.00        |
| 76                                | -0.00                               | -0.00                              | 32.00               | 3.68                          | 3.00                 | -0.00               | -0.00                    | 138.00                   | -0.00     | 54.00 | -0.00        |
| 5                                 | -0.00                               | -0.00                              | 66.00               | 1.55                          | 0.30                 | -0.00               | -0.00                    | 18.00                    | -0.00     | 50.00 | -0.00        |
| 86                                | -0.00                               | -0.00                              | 41.00               | 4.35                          | 3.00                 | -0.00               | -0.00                    | 106.00                   | -0.00     | 57.00 | -0.00        |
| 17                                | -0.00                               | -0.00                              | 57.00               | 3.00                          | 3.00                 | -0.00               | -0.00                    | 32.00                    | -0.00     | 55.00 | -0.00        |
| 86                                | -0.00                               | -0.00                              | 19.00               | 4.15                          | 3.00                 | -0.00               | -0.00                    | 130.00                   | -0.00     | 57.00 | -0.00        |
| 17                                | -0.00                               | -0.00                              | 55.00               | 2.00                          | 1.00                 | -0.00               | -0.00                    | 42.00                    | -0.00     | 55.00 | -0.00        |
| 86                                | -0.00                               | -0.00                              | 39.00               | 4.35                          | 1.00                 | -0.00               | -0.00                    | 88.00                    | -0.00     | 57.00 | -0.00        |
| 2                                 | -0.00                               | -0.00                              | 380.00              | 2.65                          | 331.00               | -0.00               | -0.00                    | 18.00                    | -0.00     | 43.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 5                                 | 9.73                               | 0.26                               | -0.00                               | 3128.53                             | -0.00                              | 8.96                                | 6.95                    | 0.18                    | -0.00                    | 2233.77                  | -0.00                   | 6.40                     |
| 55                                | 2.24                               | 0.12                               | -0.00                               | 3140.68                             | -0.00                              | 9.86                                | 3.43                    | 0.18                    | -0.00                    | 4805.24                  | -0.00                   | 15.09                    |
| 76                                | 1.74                               | 0.10                               | -0.00                               | 3141.53                             | -0.00                              | 12.32                               | 3.30                    | 0.18                    | -0.00                    | 5968.90                  | -0.00                   | 23.40                    |
| 5                                 | 8.49                               | 0.07                               | -0.00                               | 3131.13                             | -0.00                              | 3.80                                | 6.04                    | 0.07                    | -0.00                    | 2229.36                  | -0.00                   | 2.71                     |
| 86                                | 1.88                               | 0.08                               | -0.00                               | 3141.34                             | -0.00                              | 8.00                                | 3.98                    | 0.17                    | -0.00                    | 6628.22                  | -0.00                   | 16.88                    |
| 17                                | 3.79                               | 0.12                               | -0.00                               | 3138.24                             | -0.00                              | 3.50                                | 3.34                    | 0.10                    | -0.00                    | 2764.79                  | -0.00                   | 3.08                     |
| 86                                | 1.88                               | 0.09                               | -0.00                               | 3141.34                             | -0.00                              | 10.29                               | 3.96                    | 0.18                    | -0.00                    | 6628.21                  | -0.00                   | 21.71                    |
| 17                                | 5.49                               | 0.17                               | -0.00                               | 3135.42                             | -0.00                              | 6.88                                | 4.79                    | 0.15                    | -0.00                    | 2734.09                  | -0.00                   | 6.00                     |
| 86                                | 1.79                               | 0.08                               | -0.00                               | 3141.48                             | -0.00                              | 6.64                                | 3.78                    | 0.17                    | -0.00                    | 6628.52                  | -0.00                   | 14.02                    |
| 2                                 | 27.94                              | 14.31                              | -0.00                               | 3061.37                             | -0.00                              | 2.17                                | 15.48                   | 7.93                    | -0.00                    | 1696.00                  | -0.00                   | 1.20                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K<br>HP-HR | CO<br>?<br>LB/1K<br>HP-HR | THC<br>LB/1K<br>HP-HR | NO<br>LB/1K<br>HP-HR | NO<br>?<br>LB/1K<br>HP-HR | NO<br>X<br>LB/1K<br>HP-HR |
|-----------------------------------|----------------------|---------------------------|-----------------------|----------------------|---------------------------|---------------------------|
| 5                                 | 29.501               | 9481.188                  | 0.778                 | -0.000               | -0.000                    | 27.165                    |
| 55                                | 1.351                | 1891.901                  | 0.070                 | -0.000               | -0.000                    | 5.940                     |
| 76                                | 0.943                | 1703.794                  | 0.052                 | -0.000               | -0.000                    | 6.679                     |
| 5                                 | 25.644               | 9462.492                  | 0.068                 | -0.000               | -0.000                    | 11.488                    |
| 86                                | 0.998                | 1653.251                  | 0.044                 | -0.000               | -0.000                    | 4.237                     |
| 17                                | 4.138                | 3422.191                  | 0.128                 | -0.000               | -0.000                    | 3.816                     |
| 86                                | 0.995                | 1663.250                  | 0.046                 | -0.000               | -0.000                    | 5.447                     |
| 17                                | 6.083                | 3475.831                  | 0.194                 | -0.000               | -0.000                    | 7.631                     |
| 86                                | 0.749                | 1663.327                  | 0.044                 | -0.000               | -0.000                    | 3.518                     |
| 2                                 | 167.589              | 17815.148                 | 83.258                | -0.000               | -0.000                    | 12.650                    |

CAL ID NUMBER: 22 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8512  
 TEST ORGANIZATION: ALLISON DIVISION

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 13.859                    | 524.128               | 1.000              | 19.00                   | 4.389              | 165.97               | 26.442                | 43.61           | 0.10063          |
| TAKEOFF   | 1.000               | 4591.0      | 5.242                     | 2400.930              | 1.000              | 0.50                    | 0.044              | 20.01                | 2.183                 | 38.26           | 0.00114          |
| CLIMBOUT  | 0.900               | 4131.9      | 4.162                     | 2198.515              | 1.000              | 2.50                    | 0.173              | 91.60                | 1.893                 | 172.16          | 0.00101          |
| APPROACH  | 0.300               | 1377.3      | 4.465                     | 1166.815              | 1.000              | 4.50                    | 0.335              | 87.51                | 3.827                 | 103.30          | 0.00324          |
| TAXI-IDLE | 0.030               | 137.7       | 13.859                    | 524.128               | 1.000              | 7.00                    | 1.617              | 61.15                | 26.442                | 16.07           | 0.10063          |

TOTAL FOR CYCLE: 6.558 426.25 373.40  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 15.385  
 LBS POLLUTANT/1K HP-HR/CYCLE: 17.562  
 LBS POLLUTANT/1000K HP AT T.O.: 0.951

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 13.812                    | 524.128               | 1.000              | 19.00                   | 4.374              | 165.97               | 26.352                | 43.61           | 0.10028          |
| TAKEOFF   | 1.000               | 4591.0      | 0.071                     | 2400.930              | 1.000              | 0.50                    | 0.001              | 20.01                | 0.030                 | 38.26           | 0.00002          |
| CLIMBOUT  | 0.900               | 4131.9      | 0.079                     | 2198.515              | 1.000              | 2.50                    | 0.003              | 91.60                | 0.036                 | 172.16          | 0.00002          |
| APPROACH  | 0.300               | 1377.3      | 0.138                     | 1166.815              | 1.000              | 4.50                    | 0.010              | 87.51                | 0.118                 | 103.30          | 0.00010          |
| TAXI-IDLE | 0.030               | 137.7       | 13.812                    | 524.128               | 1.000              | 7.00                    | 1.611              | 61.15                | 26.352                | 16.07           | 0.10028          |

TOTAL FOR CYCLE: 5.999 426.25 373.40  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 14.075  
 LBS POLLUTANT/1K HP-HR/CYCLE: 16.067  
 LBS POLLUTANT/1000K HP AT T.O.: 0.130

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 0.414                     | 524.128               | 1.000              | 19.00                   | 0.131               | 165.97               | 0.790                 | 43.61           | 0.00301          |
| TAKEOFF   | 1.000               | 4591.0      | 30.582                    | 2400.930              | 1.000              | 0.50                    | 0.255               | 20.01                | 12.737                | 38.26           | 0.00666          |
| CLIMBOUT  | 0.900               | 4131.9      | 26.629                    | 2198.515              | 1.000              | 2.50                    | 1.110               | 91.60                | 12.112                | 172.16          | 0.00644          |
| APPROACH  | 0.300               | 1377.3      | 6.709                     | 1166.815              | 1.000              | 4.50                    | 0.503               | 87.51                | 5.750                 | 103.30          | 0.00487          |
| TAXI-IDLE | 0.030               | 137.7       | 0.414                     | 524.128               | 1.000              | 7.00                    | 0.048               | 61.15                | 0.790                 | 16.07           | 0.00301          |

TOTAL FOR CYCLE: 2.047 426.25 373.40  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 4.802  
 LBS POLLUTANT/1K HP-HR/CYCLE: 5.482  
 LBS POLLUTANT/1000K HP AT T.O.: 55.510

DATE: 6/25/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA .....

CAL ID NUMBER: 23 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8513

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 96.00 FINISH 97.00

ATMOSPHERIC PRESSURE: START 28.50 FINISH 28.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0163

RELATIVE HUMIDITY: 44.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

GREEN RUN

| CLOCK TIME | TEST MODE | THRUST, LBS (HP SHP) | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 | ENGINE SPEED RPM N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|----------------------|--------------------------|---------------------|---------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 2/ 0      | 214.20               | 4                        | 13500.00            | -0.00               | 708.00                   | 29.39                   | 0.006700 | -0.00                               | -0.00                     | 1070.00                      |
| -0.00      | 3/ 2      | 2408.60              | 52                       | 13800.00            | -0.00               | 1490.00                  | 29.01                   | 0.014300 | -0.00                               | -0.00                     | 1610.00                      |
| -0.00      | 4/ 3      | 3372.00              | 73                       | 13800.00            | -0.00               | 1862.00                  | 28.87                   | 0.017900 | -0.00                               | -0.00                     | 1850.00                      |
| -0.00      | 5/ 4      | 2656.60              | 57                       | 13800.00            | -0.00               | 1977.00                  | 28.87                   | 0.019000 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 10/ 5     | 3853.70              | 83                       | 13800.00            | -0.00               | 2074.00                  | 28.87                   | 0.020000 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 17/ 10    | 879.20               | 18                       | 13400.00            | -0.00               | 896.00                   | 29.04                   | 0.008600 | -0.00                               | -0.00                     | 1230.00                      |
| -0.00      | 6/ 17     | 3853.70              | 83                       | 13800.00            | -0.00               | 2072.00                  | 28.80                   | 0.020000 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 8/ 5      | 829.20               | 18                       | 13400.00            | -0.00               | 902.00                   | 29.08                   | 0.008600 | -0.00                               | -0.00                     | 1235.00                      |
| -0.00      | 17/ 3     | 63.50                | 1                        | 10000.00            | -0.00               | 564.00                   | 20.08                   | 0.007800 | -0.00                               | -0.00                     | 1210.00                      |
| -0.00      | 18/ 17    | 214.20               | 4                        | 13500.00            | -0.00               | 711.00                   | 29.02                   | 0.006800 | -0.00                               | -0.00                     | 1070.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (PPM) (PPM) | CO 2 (PERCENT V) | THC (PPMV) | NO (PPMV) | NO 2 (PPMV) | NO X (PPMV) | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|----------------|------------------|------------|-----------|-------------|-------------|-----------|-------|--------------|
| 4                        | -0.00                      | -0.00                     | 55.00          | 1.59             | 3.00       | 0.0       | 0.0         | 21.00       | -0.00     | 52.00 | -0.00        |
| 52                       | -0.00                      | -0.00                     | 40.00          | 3.09             | 3.00       | 0.0       | 0.0         | 21.00       | -0.00     | 52.00 | -0.00        |
| 73                       | -0.00                      | -0.00                     | 35.00          | 4.05             | 3.00       | 0.0       | 0.0         | 89.00       | -0.00     | 56.00 | -0.00        |
| 57                       | -0.00                      | -0.00                     | 36.00          | 4.26             | 22.00      | 0.0       | 0.0         | 132.00      | -0.00     | 55.00 | -0.00        |
| 83                       | -0.00                      | -0.00                     | 40.00          | 4.41             | 10.00      | 0.0       | 0.0         | 139.00      | -0.00     | 55.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 51.00          | 2.08             | 18.00      | 0.0       | 0.0         | 31.00       | -0.00     | 56.00 | -0.00        |
| 83                       | -0.00                      | -0.00                     | 39.00          | 4.44             | 19.00      | 0.0       | 0.0         | 123.00      | -0.00     | 55.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 51.00          | 2.08             | 12.00      | 0.0       | 0.0         | 37.00       | -0.00     | 56.00 | -0.00        |
| 1                        | -0.00                      | -0.00                     | 375.00         | 2.77             | 350.00     | 0.0       | 0.0         | 23.00       | -0.00     | 44.00 | -0.00        |
| 4                        | -0.00                      | -0.00                     | 30.00          | 1.60             | 3.00       | 0.0       | 0.0         | 28.00       | -0.00     | 52.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 6.90                      | 0.22                      | 0.0                        | 3133.09                    | 0.0                       | 4.33                       | 4.88              | 0.15              | 0.0                | 2218.23            | 0.0               | 3.06               |
| 52                       | 2.54                      | 0.11                      | 0.0                        | 3140.15                    | 0.0                       | 2.23                       | 1.95              | 0.17              | 0.0                | 4678.82            | 0.0               | 3.32               |
| 73                       | 1.73                      | 0.09                      | 0.0                        | 3141.57                    | 0.0                       | 7.22                       | 3.22              | 0.16              | 0.0                | 5449.59            | 0.0               | 13.44              |
| 57                       | 1.59                      | 0.67                      | 0.0                        | 3140.18                    | 0.0                       | 10.17                      | 3.34              | 1.22              | 0.0                | 6208.13            | 0.0               | 20.11              |
| 83                       | 1.81                      | 0.27                      | 0.0                        | 3140.93                    | 0.0                       | 10.35                      | 3.76              | 0.56              | 0.0                | 6514.29            | 0.0               | 21.46              |
| 18                       | 4.89                      | 1.01                      | 0.0                        | 3134.07                    | 0.0                       | 4.88                       | 4.38              | 0.90              | 0.0                | 2808.13            | 0.0               | 4.38               |
| 83                       | 1.76                      | 0.51                      | 0.0                        | 3140.36                    | 0.0                       | 9.09                       | 1.64              | 1.06              | 0.0                | 6506.83            | 0.0               | 18.44              |
| 18                       | 4.49                      | 0.67                      | 0.0                        | 3134.99                    | 0.0                       | 5.83                       | 4.41              | 0.61              | 0.0                | 2827.76            | 0.0               | 5.26               |
| 1                        | 26.39                     | 14.50                     | 0.0                        | 3063.28                    | 0.0                       | 2.66                       | 14.89             | 8.18              | 0.0                | 1727.69            | 0.0               | 1.50               |
| 4                        | 3.74                      | 0.22                      | 0.0                        | 3138.05                    | 0.0                       | 5.74                       | 2.66              | 0.15              | 0.0                | 2231.15            | 0.0               | 4.08               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 22.799         | 10355.859        | 0.723           | 0.0            | 0.0              | 14.299           |
| 52                       | 1.600          | 1942.547         | 0.071           | 0.0            | 0.0              | 1.380            |
| 73                       | 0.954          | 1734.755         | 0.049           | 0.0            | 0.0              | 3.985            |
| 57                       | 1.257          | 2336.872         | 0.458           | 0.0            | 0.0              | 7.570            |
| 83                       | 0.976          | 1590.399         | 0.146           | 0.0            | 0.0              | 5.570            |
| 18                       | 5.285          | 3396.551         | 1.090           | 0.0            | 0.0              | 5.276            |
| 83                       | 0.944          | 1688.463         | 0.275           | 0.0            | 0.0              | 4.890            |
| 18                       | 5.322          | 3410.229         | 0.732           | 0.0            | 0.0              | 6.342            |
| 1                        | 234.476        | 27207.699        | 128.776         | 0.0            | 0.0              | 23.617           |
| 4                        | 12.430         | 10416.199        | 0.723           | 0.0            | 0.0              | 19.056           |

CAL 10 NUMBER: 23 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8513

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 5.426                     | 628.715               | 1.000              | 19.00                   | 1.718              | 199.09               | 8.630                 | 43.61           | 0.03939          |
| TAKEOFF   | 1.000               | 4591.0      | 6.136                     | 2740.584              | 1.000              | 0.50                    | 0.051              | 22.84                | 2.239                 | 38.26           | 0.00134          |
| CLIMBOUT  | 0.900               | 4131.9      | 5.139                     | 2468.112              | 1.000              | 2.50                    | 0.214              | 102.84               | 2.082                 | 172.16          | 0.00124          |
| APPROACH  | 0.300               | 1377.3      | 4.754                     | 1152.463              | 1.000              | 4.50                    | 0.357              | 86.43                | 4.125                 | 103.30          | 0.00345          |
| TAXI-IDLE | 0.030               | 137.7       | 5.426                     | 628.715               | 1.000              | 7.00                    | 0.633              | 73.35                | 8.630                 | 16.07           | 0.03939          |

TOTAL FOR CYCLE: 2.973 484.55 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.136  
LBS POLLUTANT/1K HP-HR/CYCLE: 7.962  
LBS POLLUTANT/1000K HP AT T.O.: 1.114

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 7.138                     | 628.715               | 1.000              | 19.00                   | 2.261              | 199.09               | 11.354                | 43.61           | 0.05183          |
| TAKEOFF   | 1.000               | 4591.0      | 1.146                     | 2740.584              | 1.000              | 0.50                    | 0.010              | 22.84                | 0.418                 | 38.26           | 0.00025          |
| CLIMBOUT  | 0.900               | 4131.9      | 1.060                     | 2468.112              | 1.000              | 2.50                    | 0.044              | 102.84               | 0.430                 | 172.16          | 0.00026          |
| APPROACH  | 0.300               | 1377.3      | 0.909                     | 1152.463              | 1.000              | 4.50                    | 0.068              | 86.43                | 0.789                 | 103.30          | 0.00066          |
| TAXI-IDLE | 0.030               | 137.7       | 7.138                     | 628.715               | 1.000              | 7.00                    | 0.833              | 73.35                | 11.354                | 16.07           | 0.05183          |

TOTAL FOR CYCLE: 3.215 484.55 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.636  
LBS POLLUTANT/1K HP-HR/CYCLE: 8.611  
LBS POLLUTANT/1000K HP AT T.O.: 2.081

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE | 0.030               | 137.7       | 1.698                     | 628.715               | 1.000              | 19.00                   | 0.538               | 199.09               | 2.700                  | 43.61           | 0.01233           |
| TAKEOFF   | 1.000               | 4591.0      | 30.009                    | 2740.584              | 1.000              | 0.50                    | 0.250               | 22.84                | 10.950                 | 38.26           | 0.00654           |
| CLIMBOUT  | 0.900               | 4131.9      | 25.767                    | 2468.112              | 1.000              | 2.50                    | 1.074               | 102.84               | 10.440                 | 172.16          | 0.00624           |
| APPROACH  | 0.300               | 1377.3      | 6.562                     | 1152.463              | 1.000              | 4.50                    | 0.492               | 86.43                | 5.694                  | 103.30          | 0.00476           |
| TAXI-IDLE | 0.030               | 137.7       | 1.698                     | 628.715               | 1.000              | 7.00                    | 0.198               | 73.35                | 2.700                  | 16.07           | 0.01233           |

TOTAL FOR CYCLE: 2.551 484.55 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.266  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.833  
LBS POLLUTANT/1000K HP AT T.O.: 54.471

DATE: 6/29/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 24 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8517

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 94.00

ATMOSPHERIC PRESSURE: START 28.90 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 48.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 11

COMMENTS:

GREEN RUN

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1    | N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|-------|----|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 2/ 0      | 235.60                   | 5                  | 13500.00         | -0.00 |    | 726.00                   | 20.09                   | 0.006700 | -0.00                               | -0.00                     | 1070.00                      |
| -0.00      | 3/ 2      | 2539.90                  | 55                 | 13800.00         | -0.00 |    | 1570.00                  | 29.76                   | 0.014700 | -0.00                               | -0.00                     | 1610.00                      |
| -0.00      | 4/ 3      | 3547.20                  | 77                 | 13800.00         | -0.00 |    | 1950.00                  | 29.59                   | 0.018300 | -0.00                               | -0.00                     | 1850.00                      |
| -0.00      | 5/ 4      | 3809.40                  | 82                 | 13800.00         | -0.00 |    | 2065.00                  | 29.45                   | 0.019500 | -0.00                               | -0.00                     | 1920.00                      |
| -0.00      | 10/ 5     | 4028.90                  | 87                 | 13800.00         | -0.00 |    | 2150.00                  | 29.38                   | 0.020300 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 12/ 10    | 4079.90                  | 17                 | 13400.00         | -0.00 |    | 892.00                   | 29.65                   | 0.008400 | -0.00                               | -0.00                     | 1200.00                      |
| -0.00      | 6/ 12     | 4028.90                  | 87                 | 13800.00         | -0.00 |    | 2150.00                  | 29.38                   | 0.020300 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 8/ 6      | 829.20                   | 18                 | 13400.00         | -0.00 |    | 896.00                   | 29.65                   | 0.008400 | -0.00                               | -0.00                     | 1200.00                      |
| -0.00      | 14/ 8     | 4028.90                  | 87                 | 13800.00         | -0.00 |    | 2150.00                  | 29.38                   | 0.020300 | -0.00                               | -0.00                     | 1970.00                      |
| -0.00      | 17/ 14    | 95.20                    | 2                  | 10000.00         | -0.00 |    | 586.00                   | 20.16                   | 0.008100 | -0.00                               | -0.00                     | 1140.00                      |
| -0.00      | 18/ 17    | 235.60                   | 5                  | 13500.00         | -0.00 |    | 1100.00                  | 29.65                   | 0.010300 | -0.00                               | -0.00                     | 1075.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 54.00         | 1.40                 | 3.00           | 0.0           | -0.00           | 24.00           | 0.0       | 51.00 | -0.00        |
| 55                       | -0.00                      | -0.00                     | 34.00         | 2.98                 | 4.00           | 0.0           | -0.00           | 68.00           | 0.0       | 58.00 | -0.00        |
| 77                       | -0.00                      | -0.00                     | 32.00         | 4.23                 | 3.00           | 0.0           | -0.00           | 107.00          | 0.0       | 56.00 | -0.00        |
| 82                       | -0.00                      | -0.00                     | 30.00         | 4.79                 | 3.00           | 0.0           | -0.00           | 114.00          | 0.0       | 57.00 | -0.00        |
| 87                       | -0.00                      | -0.00                     | 32.00         | 4.98                 | 3.00           | 0.0           | -0.00           | 107.00          | 0.0       | 56.00 | -0.00        |
| 17                       | -0.00                      | -0.00                     | 46.00         | 2.35                 | 3.00           | 0.0           | -0.00           | 37.00           | 0.0       | 54.00 | -0.00        |
| 87                       | -0.00                      | -0.00                     | 30.00         | 4.93                 | 3.00           | 0.0           | -0.00           | 111.00          | 0.0       | 56.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 46.00         | 2.30                 | 3.00           | 0.0           | -0.00           | 34.00           | 0.0       | 54.00 | -0.00        |
| 87                       | -0.00                      | -0.00                     | 29.00         | 4.90                 | 3.00           | 0.0           | -0.00           | 102.00          | 0.0       | 56.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 370.00        | 3.18                 | 350.00         | 0.0           | -0.00           | 20.00           | 0.0       | 42.00 | -0.00        |
| 5                        | -0.00                      | -0.00                     | 55.00         | 1.18                 | 3.00           | 0.0           | -0.00           | 38.00           | 0.0       | 52.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FLOW CO LB/1K LB FUEL | MASS FLOW HC LB/1K LB FUEL | MASS FLOW NO2 LB/1K LB FUEL | MASS FLOW CO2 LB/1K LB FUEL | MASS FLOW NO LB/1K LB FUEL | MASS FLOW NOX LB/1K LB FUEL | MASS FLOW CO LB/HR | MASS FLOW HC LB/HR | MASS FLOW NO2 LB/HR | MASS FLOW CO2 LB/HR | MASS FLOW NO LB/HR | MASS FLOW NOX LB/HR |
|--------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| 5                        | 7.69                       | 0.25                       | -0.00                       | 3131.77                     | 0.0                        | 5.61                        | 5.58               | 0.16               | -0.00               | 2273.64             | 0.0                | 4.07                |
| 55                       | 2.28                       | 0.12                       | -0.00                       | 3140.62                     | 0.0                        | 7.49                        | 3.58               | 0.19               | -0.00               | 4930.76             | 0.0                | 11.76               |
| 77                       | 1.51                       | 0.08                       | -0.00                       | 3141.91                     | 0.0                        | 8.31                        | 2.95               | 0.16               | -0.00               | 6126.73             | 0.0                | 16.20               |
| 82                       | 1.25                       | 0.08                       | -0.00                       | 3142.35                     | 0.0                        | 7.82                        | 2.59               | 0.16               | -0.00               | 6488.95             | 0.0                | 16.14               |
| 87                       | 1.29                       | 0.07                       | -0.00                       | 3142.31                     | 0.0                        | 7.06                        | 2.76               | 0.16               | -0.00               | 6755.96             | 0.0                | 15.17               |
| 17                       | 3.91                       | 0.15                       | -0.00                       | 3137.97                     | 0.0                        | 4.47                        | 3.49               | 0.13               | -0.00               | 2799.07             | 0.0                | 3.98                |
| 87                       | 1.22                       | 0.07                       | -0.00                       | 3142.41                     | 0.0                        | 7.40                        | 2.62               | 0.16               | -0.00               | 6756.18             | 0.0                | 15.90               |
| 18                       | 3.99                       | 0.15                       | -0.00                       | 3137.83                     | 0.0                        | 4.85                        | 3.58               | 0.14               | -0.00               | 2811.50             | 0.0                | 4.34                |
| 87                       | 1.19                       | 0.07                       | -0.00                       | 3142.46                     | 0.0                        | 6.84                        | 2.54               | 0.16               | -0.00               | 6756.79             | 0.0                | 14.70               |
| 2                        | 19.72                      | 12.74                      | -0.00                       | 3078.59                     | 0.0                        | 2.62                        | 11.55              | 7.47               | -0.00               | 1806.05             | 0.0                | 1.19                |
| 5                        | 9.28                       | 0.29                       | -0.00                       | 3129.14                     | 0.0                        | 10.53                       | 10.21              | 0.32               | -0.00               | 3442.05             | 0.0                | 11.59               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 23.691         | 9650.520         | 0.764           | 0.0            | -0.000           | 17.295           |
| 55                       | 1.410          | 1941.322         | 0.073           | 0.0            | -0.000           | 4.631            |
| 77                       | 0.932          | 1727.202         | 0.047           | 0.0            | -0.000           | 4.567            |
| 82                       | 0.679          | 1703.181         | 0.041           | 0.0            | -0.000           | 4.238            |
| 87                       | 0.686          | 1676.874         | 0.039           | 0.0            | -0.000           | 3.766            |
| 17                       | 4.316          | 3444.625         | 0.165           | 0.0            | -0.000           | 4.932            |
| 87                       | 0.649          | 1676.430         | 0.039           | 0.0            | -0.000           | 3.947            |
| 18                       | 4.116          | 3390.614         | 0.165           | 0.0            | -0.000           | 5.240            |
| 87                       | 0.632          | 1676.958         | 0.039           | 0.0            | -0.000           | 3.649            |
| 2                        | 121.366        | 18950.141        | 78.431          | 0.0            | -0.000           | 12.459           |
| 5                        | 43.340         | 14609.723        | 1.370           | 0.0            | -0.000           | 49.184           |

CAL ID NUMBER: 24 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8517

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 8.492                     | 379.608               | 1.000              | 19.00                   | 2.689              | 120.21               | 22.371                | 43.61           | 0.06166          |
| TAKEOFF   | 1.000               | 4591.0      | 1.631                     | 2394.919              | 1.000              | 0.50                    | 0.014              | 19.96                | 0.681                 | 38.26           | 0.00036          |
| CLIMBOUT  | 0.900               | 4131.9      | 2.269                     | 2205.268              | 1.000              | 2.50                    | 0.095              | 91.89                | 1.029                 | 172.16          | 0.00055          |
| APPROACH  | 0.300               | 1377.3      | 3.876                     | 1154.689              | 1.000              | 4.50                    | 0.291              | 86.60                | 3.356                 | 103.30          | 0.00281          |
| TAXI-IDLE | 0.030               | 137.7       | 8.492                     | 379.608               | 1.000              | 7.00                    | 0.991              | 44.29                | 22.371                | 16.07           | 0.06166          |

TOTAL FOR CYCLE: 4.079 362.94 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 11.238  
LBS POLLUTANT/1K HP-HR/CYCLE: 10.923  
LBS POLLUTANT/1000K HP AT T.O.: 0.296

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 4.476                     | 379.608               | 1.000              | 19.00                   | 1.417              | 120.21               | 11.791                | 43.61           | 0.03250          |
| TAKEOFF   | 1.000               | 4591.0      | 0.0                       | 2394.919              | 1.000              | 0.50                    | 0.0                | 19.96                | 0.0                   | 38.26           | 0.0              |
| CLIMBOUT  | 0.900               | 4131.9      | 0.032                     | 2205.268              | 1.000              | 2.50                    | 0.001              | 91.89                | 0.015                 | 172.16          | 0.00001          |
| APPROACH  | 0.300               | 1377.3      | 0.161                     | 1154.689              | 1.000              | 4.50                    | 0.012              | 86.60                | 0.139                 | 103.30          | 0.00012          |
| TAXI-IDLE | 0.030               | 137.7       | 4.476                     | 379.608               | 1.000              | 7.00                    | 0.522              | 44.29                | 11.791                | 16.07           | 0.03250          |

TOTAL FOR CYCLE: 1.953 362.94 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.381  
LBS POLLUTANT/1K HP-HR/CYCLE: 5.230  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 0.777                     | 379.608               | 1.000              | 19.00                   | 0.246               | 120.21               | 2.048                 | 43.61           | 0.00564          |
| TAKEOFF   | 1.000               | 4591.0      | 19.712                    | 2394.919              | 1.000              | 0.50                    | 0.164               | 19.96                | 8.231                 | 38.26           | 0.00429          |
| CLIMBOUT  | 0.900               | 4131.9      | 18.118                    | 2205.268              | 1.000              | 2.50                    | 0.755               | 91.89                | 8.216                 | 172.16          | 0.00438          |
| APPROACH  | 0.300               | 1377.3      | 6.666                     | 1154.689              | 1.000              | 4.50                    | 0.500               | 86.60                | 5.773                 | 103.30          | 0.00484          |
| TAXI-IDLE | 0.030               | 137.7       | 0.777                     | 379.608               | 1.000              | 7.00                    | 0.091               | 44.29                | 2.048                 | 16.07           | 0.00564          |

TOTAL FOR CYCLE: 1.756 362.94 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.838  
LBS POLLUTANT/1K HP-HR/CYCLE: 4.703  
LBS POLLUTANT/1000K HP AT T.O.: 35.780

DATE: 6/18/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA .....

CAL ID NUMBER: 25 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8508

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 88.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LA AIR: 0.0094

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

FINAL RUN

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                    |                          | N1               | N2                       |                         |          |                                     |                           |                              |
| -0.00      | 1/ 0      | 257.00             | 5                        | 13500.00         | -0.00                    | 732.00                  | 30.60    | 0.006600                            | -0.00                     | 1075.00                      |
| -0.00      | 2/ 1      | 2671.30            | 58                       | 13800.00         | -0.00                    | 1572.00                 | 30.64    | 0.014300                            | -0.00                     | 1610.00                      |
| -0.00      | 3/ 2      | 3853.70            | 83                       | 13800.00         | -0.00                    | 1980.00                 | 30.21    | 0.018200                            | -0.00                     | 1850.00                      |
| -0.00      | 5/ 3      | 4247.80            | 92                       | 13800.00         | -0.00                    | 2190.00                 | 30.07    | 0.020200                            | -0.00                     | 1970.00                      |
| -0.00      | 6/ 5      | 1157.20            | 25                       | 14300.00         | -0.00                    | 1080.00                 | 28.13    | 0.010700                            | -0.00                     | 1375.00                      |
| -0.00      | 7/ 6      | 786.70             | 17                       | 13400.00         | -0.00                    | 916.00                  | 30.37    | 0.008500                            | -0.00                     | 1220.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (CRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DPY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 55.00         | 1.35                 | 23.00          | -0.00         | -0.00           | 29.00           | -0.00     | 56.00 | -0.00        |
| 58                       | -0.00                      | -0.00                     | 32.00         | 3.12                 | 11.00          | -0.00         | -0.00           | 94.00           | -0.00     | 60.00 | -0.00        |
| 83                       | -0.00                      | -0.00                     | 34.00         | 3.66                 | 10.00          | -0.00         | -0.00           | 176.00          | -0.00     | 60.00 | -0.00        |
| 92                       | -0.00                      | -0.00                     | 35.00         | 4.19                 | 10.00          | -0.00         | -0.00           | 160.00          | -0.00     | 58.00 | -0.00        |
| 25                       | -0.00                      | -0.00                     | 35.00         | 2.50                 | 30.00          | -0.00         | -0.00           | 76.00           | -0.00     | 59.00 | -0.00        |
| 17                       | -0.00                      | -0.00                     | 49.00         | 2.03                 | 10.00          | -0.00         | -0.00           | 42.00           | -0.00     | 58.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 8.11                      | 1.97                      | -0.00                      | 3126.39                    | -0.00                     | 7.02                       | 5.93              | 1.44              | -0.00              | 2288.52            | -0.00             | 5.14               |
| 58                       | 2.05                      | 0.42                      | -0.00                      | 3140.16                    | -0.00                     | 9.89                       | 3.22              | 0.65              | -0.00              | 4936.33            | -0.00             | 15.55              |
| 83                       | 1.86                      | 0.32                      | -0.00                      | 3140.72                    | -0.00                     | 11.30                      | 3.68              | 0.64              | -0.00              | 6218.62            | -0.00             | 22.39              |
| 92                       | 1.67                      | 0.28                      | -0.00                      | 3141.12                    | -0.00                     | 12.54                      | 3.66              | 0.62              | -0.00              | 6879.05            | -0.00             | 27.46              |
| 25                       | 2.79                      | 1.41                      | -0.00                      | 3136.28                    | -0.00                     | 9.97                       | 3.02              | 1.52              | -0.00              | 3387.18            | -0.00             | 10.76              |
| 17                       | 4.82                      | 0.57                      | -0.00                      | 3135.38                    | -0.00                     | 6.78                       | 4.41              | 0.53              | -0.00              | 2872.01            | -0.00             | 6.21               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 23.089         | 8904.738         | 5.604           | -0.000         | -0.000           | 19.997           |
| 58                       | 1.206          | 1847.914         | 0.245           | -0.000         | -0.000           | 5.820            |
| 83                       | 0.454          | 1613.675         | 0.167           | -0.000         | -0.000           | 5.807            |
| 92                       | 0.861          | 1619.440         | 0.147           | -0.000         | -0.000           | 6.465            |
| 25                       | 2.608          | 2927.048         | 1.312           | -0.000         | -0.000           | 9.302            |
| 17                       | 5.408          | 3650.703         | 0.669           | -0.000         | -0.000           | 7.896            |

CAL ID NUMBER: 25 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8508

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 5.637                     | 648.213               | 1.000              | 19.00                   | 1.785              | 205.27               | 8.696                 | 43.61           | 0.04093          |
| TAKEOFF   | 1.000               | 4591.0      | 4.140                     | 2401.677              | 1.000              | 0.50                    | 0.034              | 20.01                | 1.724                 | 38.26           | 0.00090          |
| CLIMBOUT  | 0.900               | 4131.9      | 3.825                     | 2167.244              | 1.000              | 2.50                    | 0.159              | 90.30                | 1.765                 | 172.16          | 0.00093          |
| APPROACH  | 0.300               | 1377.3      | 2.946                     | 1141.898              | 1.000              | 4.50                    | 0.221              | 85.64                | 2.580                 | 103.30          | 0.00214          |
| TAXI-IDLE | 0.030               | 137.7       | 5.637                     | 648.213               | 1.000              | 7.00                    | 0.658              | 75.62                | 8.696                 | 16.07           | 0.04093          |

TOTAL FOR CYCLE: 2.857 476.85 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.992  
LBS POLLUTANT/1K HP-HR/CYCLE: 7.653  
LBS POLLUTANT/1000K HP AT T.O.: 0.791

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 1.984                     | 648.213               | 1.000              | 19.00                   | 0.628              | 205.27               | 3.060                 | 43.61           | 0.01440          |
| TAKEOFF   | 1.000               | 4591.0      | 2.211                     | 2401.677              | 1.000              | 0.50                    | 0.018              | 20.01                | 0.921                 | 38.26           | 0.00048          |
| CLIMBOUT  | 0.900               | 4131.9      | 1.972                     | 2167.244              | 1.000              | 2.50                    | 0.082              | 90.30                | 0.910                 | 172.16          | 0.00048          |
| APPROACH  | 0.300               | 1377.3      | 0.966                     | 1141.898              | 1.000              | 4.50                    | 0.072              | 85.64                | 0.846                 | 103.30          | 0.00070          |
| TAXI-IDLE | 0.030               | 137.7       | 1.984                     | 648.213               | 1.000              | 7.00                    | 0.231              | 75.62                | 3.060                 | 16.07           | 0.01440          |

TOTAL FOR CYCLE: 1.033 476.85 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.165  
LBS POLLUTANT/1K HP-HR/CYCLE: 2.765  
LBS POLLUTANT/1000K HP AT T.O.: 4.014

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 2.308                     | 648.213               | 1.000              | 19.00                   | 0.731               | 205.27               | 3.561                 | 43.61           | 0.01676          |
| TAKEOFF   | 1.000               | 4591.0      | 61.740                    | 2401.677              | 1.000              | 0.50                    | 0.514               | 20.01                | 25.707                | 38.26           | 0.01345          |
| CLIMBOUT  | 0.900               | 4131.9      | 25.617                    | 2167.244              | 1.000              | 2.50                    | 1.067               | 90.30                | 11.820                | 172.16          | 0.00620          |
| APPROACH  | 0.300               | 1377.3      | 9.331                     | 1141.898              | 1.000              | 4.50                    | 0.700               | 85.64                | 8.172                 | 103.30          | 0.00678          |
| TAXI-IDLE | 0.030               | 137.7       | 2.308                     | 648.213               | 1.000              | 7.00                    | 0.269               | 75.62                | 3.561                 | 16.07           | 0.01676          |

TOTAL FOR CYCLE: 3.282 476.85 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.883  
LBS POLLUTANT/1K HP-HR/CYCLE: 8.789  
LBS POLLUTANT/1000K HP AT T.O.: 112.067

DATE: 6/24/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 76 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8507

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 28.70 FINISH 28.90

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0092

RELATIVE HUMIDITY: 38.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

FINAL RUN

| CLOCK TIME | TEST MODE | POWER THPUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1    | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|-------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 235.60                   | 5                  | 13500.00         | -0.00 | 720.00  | 30.29                    | 0.006600                | -0.00    | -0.00                               | 1075.00                   |                              |
| -0.00      | 2/ 1      | 2539.90                  | 55                 | 13800.00         | -0.00 | 1550.00 | 30.00                    | 0.014400                | -0.00    | -0.00                               | 1610.00                   |                              |
| -0.00      | 7/ 2      | 3591.00                  | 78                 | 13800.00         | -0.00 | 1950.00 | 29.86                    | 0.018100                | -0.00    | -0.00                               | 1850.00                   |                              |
| -0.00      | 4/ 3      | 3875.60                  | 84                 | 13800.00         | -0.00 | 2080.00 | 29.72                    | 0.019400                | -0.00    | -0.00                               | 1920.00                   |                              |
| -0.00      | 5/ 4      | 4116.50                  | 89                 | 13800.00         | -0.00 | 2170.00 | 29.65                    | 0.020300                | -0.00    | -0.00                               | 1970.00                   |                              |
| -0.00      | 7/ 5      | 879.10                   | 18                 | 13400.00         | -0.00 | 910.00  | 29.86                    | 0.008500                | -0.00    | -0.00                               | 1225.00                   |                              |
| -0.00      | 9/ 7      | 4116.50                  | 89                 | 13800.00         | -0.00 | 2170.00 | 29.65                    | 0.020300                | -0.00    | -0.00                               | 1970.00                   |                              |
| -0.00      | 11/ 9     | 879.10                   | 18                 | 13400.00         | -0.00 | 908.00  | 29.86                    | 0.008400                | -0.00    | -0.00                               | 1220.00                   |                              |
| -0.00      | 14/11     | 95.20                    | 2                  | 10000.00         | -0.00 | 576.00  | 20.08                    | 0.008000                | -0.00    | -0.00                               | 1205.00                   |                              |
| -0.00      | 15/14     | 235.60                   | 5                  | 13500.00         | -0.00 | 720.00  | 29.80                    | 0.006700                | -0.00    | -0.00                               | 1090.00                   |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 60.00         | 2.14                 | 45.00          | -0.00         | -0.00           | 32.00           | -0.00     | 52.00 | -0.00        |
| 55                       | -0.00                      | -0.00                     | 34.00         | 3.36                 | 3.00           | -0.00         | -0.00           | 92.00           | -0.00     | 54.00 | -0.00        |
| 78                       | -0.00                      | -0.00                     | 36.00         | 4.27                 | 3.00           | -0.00         | -0.00           | 120.00          | -0.00     | 57.00 | -0.00        |
| 84                       | -0.00                      | -0.00                     | 37.00         | 4.27                 | 3.00           | -0.00         | -0.00           | 108.00          | -0.00     | 58.00 | -0.00        |
| 89                       | -0.00                      | -0.00                     | 40.00         | 4.49                 | 3.00           | -0.00         | -0.00           | 132.00          | -0.00     | 54.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 54.00         | 2.14                 | 3.00           | -0.00         | -0.00           | 51.00           | -0.00     | 54.00 | -0.00        |
| 89                       | -0.00                      | -0.00                     | 42.00         | 4.61                 | 3.00           | -0.00         | -0.00           | 150.00          | -0.00     | 55.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 54.00         | 2.14                 | 3.00           | -0.00         | -0.00           | 51.00           | -0.00     | 54.00 | -0.00        |
| 2                        | -0.00                      | -0.00                     | 390.00        | 2.43                 | 400.00         | -0.00         | -0.00           | 32.00           | -0.00     | 43.00 | -0.00        |
| 5                        | -0.00                      | -0.00                     | 67.00         | 1.75                 | 3.00           | -0.00         | -0.00           | 34.00           | -0.00     | 52.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI HN LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 5.58                      | 2.45                      | -0.00                      | 3129.03                    | -0.00                     | 4.89                       | 4.02              | 1.76              | -0.00              | 2252.90            | -0.00             | 3.52               |
| 55                       | 2.02                      | 0.11                      | -0.00                      | 3141.06                    | -0.00                     | 8.01                       | 3.14              | 0.16              | -0.00              | 4868.63            | -0.00             | 12.42              |
| 78                       | 1.69                      | 0.08                      | -0.00                      | 3141.65                    | -0.00                     | 9.23                       | 3.29              | 0.16              | -0.00              | 6126.21            | -0.00             | 18.00              |
| 84                       | 1.73                      | 0.08                      | -0.00                      | 3141.57                    | -0.00                     | 8.31                       | 3.60              | 0.17              | -0.00              | 6534.46            | -0.00             | 17.28              |
| 89                       | 1.78                      | 0.08                      | -0.00                      | 3141.51                    | -0.00                     | 9.65                       | 3.87              | 0.17              | -0.00              | 6817.07            | -0.00             | 20.95              |
| 18                       | 5.04                      | 0.16                      | -0.00                      | 3136.16                    | -0.00                     | 7.81                       | 4.58              | 0.15              | -0.00              | 2853.91            | -0.00             | 7.11               |
| 89                       | 1.87                      | 0.08                      | -0.00                      | 3141.45                    | -0.00                     | 10.69                      | 3.95              | 0.17              | -0.00              | 6816.94            | -0.00             | 23.19              |
| 18                       | 5.04                      | 0.16                      | -0.00                      | 3136.16                    | -0.00                     | 7.81                       | 4.57              | 0.15              | -0.00              | 2847.63            | -0.00             | 7.09               |
| 2                        | 26.82                     | 16.70                     | -0.00                      | 3057.94                    | -0.00                     | 3.61                       | 15.45             | 4.33              | -0.00              | 1761.37            | -0.00             | 7.08               |
| 5                        | 7.63                      | 0.20                      | -0.00                      | 3131.99                    | -0.00                     | 6.36                       | 5.49              | 0.14              | -0.00              | 2255.03            | -0.00             | 4.58               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 17.063         | 9562.414         | 7.484           | -0.000         | -0.000           | 14.948           |
| 55                       | 1.235          | 1916.861         | 0.064           | -0.000         | -0.000           | 4.390            |
| 78                       | 0.915          | 1705.989         | 0.066           | -0.000         | -0.000           | 5.012            |
| 84                       | 0.930          | 1686.053         | 0.065           | -0.000         | -0.000           | 4.458            |
| 89                       | 0.934          | 1656.035         | 0.062           | -0.000         | -0.000           | 5.090            |
| 18                       | 5.528          | 3442.174         | 0.180           | -0.000         | -0.000           | 8.576            |
| 89                       | 0.960          | 1656.005         | 0.061           | -0.000         | -0.000           | 5.633            |
| 18                       | 5.516          | 3434.609         | 0.179           | -0.000         | -0.000           | 8.557            |
| 2                        | 162.276        | 13501.820        | 98.016          | -0.000         | -0.000           | 21.871           |
| 5                        | 23.123         | 9571.445         | 0.608           | -0.000         | -0.000           | 19.440           |

CAL ID NUMBER: 26 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8507

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 8.970                     | 456.065               | 1.000              | 19.00                   | 2.840              | 144.42               | 19.668                | 43.61           | 0.06513          |
| TAKEOFF   | 1.000               | 4591.0      | 4.270                     | 2434.323              | 1.000              | 0.50                    | 0.036              | 20.29                | 1.754                 | 38.26           | 0.00093          |
| CLIMBOUT  | 0.900               | 4131.9      | 3.738                     | 2200.739              | 1.000              | 2.50                    | 0.156              | 91.70                | 1.699                 | 172.16          | 0.00090          |
| APPROACH  | 0.300               | 1377.3      | 4.223                     | 1158.112              | 1.000              | 4.50                    | 0.317              | 86.86                | 3.646                 | 103.30          | 0.00307          |
| TAXI-IDLE | 0.030               | 137.7       | 8.970                     | 456.065               | 1.000              | 7.00                    | 1.046              | 53.21                | 19.668                | 16.07           | 0.06513          |

TOTAL FOR CYCLE: 4.395 396.47 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 11.085  
LBS POLLUTANT/1K HP-HR/CYCLE: 11.770  
LBS POLLUTANT/1000K HP AT T.O.: 0.775

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 9.176                     | 456.065               | 1.000              | 19.00                   | 2.906              | 144.42               | 20.120                | 43.61           | 0.06662          |
| TAKEOFF   | 1.000               | 4591.0      | 0.0                       | 2434.323              | 1.000              | 0.50                    | 0.0                | 20.29                | 0.0                   | 38.26           | 0.0              |
| CLIMBOUT  | 0.900               | 4131.9      | 0.030                     | 2200.739              | 1.000              | 2.50                    | 0.001              | 91.70                | 0.014                 | 172.16          | 0.00001          |
| APPROACH  | 0.300               | 1377.3      | 0.124                     | 1158.112              | 1.000              | 4.50                    | 0.009              | 86.86                | 0.107                 | 103.30          | 0.00009          |
| TAXI-IDLE | 0.030               | 137.7       | 9.176                     | 456.065               | 1.000              | 7.00                    | 1.071              | 53.21                | 20.120                | 16.07           | 0.06662          |

TOTAL FOR CYCLE: 3.987 396.47 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 10.056  
LBS POLLUTANT/1K HP-HR/CYCLE: 10.677  
LBS POLLUTANT/1000K HP AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.030               | 137.7       | 1.636                     | 456.065               | 1.000              | 19.00                   | 0.518               | 144.42               | 3.588                 | 43.61           | 0.01188          |
| TAKEOFF   | 1.000               | 4591.0      | 23.695                    | 2434.323              | 1.000              | 0.50                    | 0.197               | 20.29                | 9.734                 | 38.26           | 0.00516          |
| CLIMBOUT  | 0.900               | 4131.9      | 21.150                    | 2200.739              | 1.000              | 2.50                    | 0.881               | 91.70                | 9.610                 | 172.16          | 0.00512          |
| APPROACH  | 0.300               | 1377.3      | 6.582                     | 1158.112              | 1.000              | 4.50                    | 0.494               | 86.86                | 5.683                 | 103.30          | 0.00478          |
| TAXI-IDLE | 0.030               | 137.7       | 1.636                     | 456.065               | 1.000              | 7.00                    | 0.191               | 53.21                | 3.588                 | 16.07           | 0.01188          |

TOTAL FOR CYCLE: 2.281 396.47 373.40  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.754  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.110  
LBS POLLUTANT/1000K HP AT T.O.: 43.010

DATE: 6/21/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 27 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8510

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANF OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 84.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH 28.90

INLET AIR HUMIDITY, LBS H2O/L9 AIR: 0.0118

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

FINAL RUN

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER, LBS PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|-------------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 735.60             | 5                             | 13500.00         | -0.00                    | 720.00                  | 10.60    | 0.006500                            | -0.00                     | 1055.00                      |
| -0.00      | 2/ 1      | 2715.10            | 59                            | 13800.00         | -0.00                    | 1570.00                 | 10.53    | 0.014300                            | -0.00                     | 1610.00                      |
| -0.00      | 3/ 2      | 3809.90            | 82                            | 13800.00         | -0.00                    | 2000.00                 | 10.32    | 0.018300                            | -0.00                     | 1850.00                      |
| -0.00      | 5/ 3      | 4335.40            | 94                            | 13800.00         | -0.00                    | 2210.00                 | 10.29    | 0.020300                            | -0.00                     | 1970.00                      |
| -0.00      | 6/ 5      | 1111.80            | 24                            | 14300.00         | -0.00                    | 1041.00                 | 28.25    | 0.010200                            | -0.00                     | 1365.00                      |
| -0.00      | 7/ 6      | 871.70             | 18                            | 13400.00         | -0.00                    | 899.00                  | 30.25    | 0.008300                            | -0.00                     | 1210.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 49.00         | 1.63                 | 26.00          | -0.00         | -0.00           | 31.00           | -0.00     | 53.00 | -0.00        |
| 59                       | -0.00                      | -0.00                     | 34.00         | 3.52                 | 11.00          | -0.00         | -0.00           | 74.00           | -0.00     | 57.00 | -0.00        |
| 82                       | -0.00                      | -0.00                     | 35.00         | 4.45                 | 2.00           | -0.00         | -0.00           | 102.00          | -0.00     | 60.00 | -0.00        |
| 94                       | -0.00                      | -0.00                     | 38.00         | 4.38                 | 3.00           | -0.00         | -0.00           | 100.00          | -0.00     | 58.00 | -0.00        |
| 24                       | -0.00                      | -0.00                     | 33.00         | 3.14                 | 2.00           | -0.00         | -0.00           | 82.00           | -0.00     | 58.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 52.00         | 2.22                 | 1.00           | -0.00         | -0.00           | 31.00           | -0.00     | 57.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 5.99                      | 1.85                      | -0.00                      | 3130.04                    | -0.00                     | 6.22                       | 4.31              | 1.33              | -0.00              | 2251.63            | -0.00             | 4.48               |
| 59                       | 1.93                      | 0.37                      | -0.00                      | 3140.48                    | -0.00                     | 6.40                       | 3.03              | 0.58              | -0.00              | 4940.54            | -0.00             | 10.84              |
| 82                       | 1.57                      | 0.05                      | -0.00                      | 3141.91                    | -0.00                     | 7.53                       | 3.15              | 0.11              | -0.00              | 6283.81            | -0.00             | 15.04              |
| 94                       | 1.73                      | 0.08                      | -0.00                      | 3141.57                    | -0.00                     | 7.50                       | 3.83              | 0.18              | -0.00              | 6942.88            | -0.00             | 16.57              |
| 24                       | 2.77                      | 0.07                      | -0.00                      | 3141.06                    | -0.00                     | 8.47                       | 2.16              | 0.08              | -0.00              | 3269.44            | -0.00             | 8.81               |
| 18                       | 4.68                      | 0.05                      | -0.00                      | 3137.03                    | -0.00                     | 4.58                       | 4.20              | 0.05              | -0.00              | 2820.19            | -0.00             | 4.12               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 18.301         | 9565.500         | 5.651           | -0.000         | -0.000           | 19.018           |
| 59                       | 1.116          | 1815.971         | 0.214           | -0.000         | -0.000           | 3.991            |
| 82                       | 0.826          | 1649.337         | 0.028           | -0.000         | -0.000           | 3.952            |
| 94                       | 0.884          | 1601.439         | 0.042           | -0.000         | -0.000           | 3.822            |
| 24                       | 1.942          | 2941.036         | 0.070           | -0.000         | -0.000           | 7.928            |
| 18                       | 4.423          | 3235.279         | 0.054           | -0.000         | -0.000           | 4.723            |

CAL ID NUMBER: 27 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8510

| MODE      | FRACTIONAL POWER | POWER HP | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | CO MASS LBS. | FUEL MASS LBS. | LB CO / 1K LB FUEL | ENERGY HP-HR | LB CO / HP-HR |
|-----------|------------------|----------|---------------------|-----------------|-----------------|-------------------|--------------|----------------|--------------------|--------------|---------------|
| TAXI-IDLE | 0.030            | 137.7    | 3.380               | 397.675         | 1.000           | 19.00             | 1.070        | 125.93         | 8.500              | 43.61        | 0.02454       |
| TAKEOFF   | 1.000            | 4591.0   | 3.777               | 2306.891        | 1.000           | 0.50              | 0.031        | 19.22          | 1.637              | 38.26        | 0.00082       |
| CLIMBOUT  | 0.900            | 4131.9   | 3.279               | 2104.478        | 1.000           | 2.50              | 0.137        | 87.69          | 1.558              | 172.16       | 0.00079       |
| APPROACH  | 0.300            | 1377.3   | 2.179               | 1139.468        | 1.000           | 4.50              | 0.163        | 85.46          | 1.912              | 103.30       | 0.00158       |
| TAXI-IDLE | 0.030            | 137.7    | 3.380               | 397.675         | 1.000           | 7.00              | 0.394        | 46.40          | 8.500              | 16.07        | 0.02454       |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 1.196  
LBS POLLUTANT/1K HP-HR/CYCLE: 4.925  
LBS POLLUTANT/1000K HP AT T.O.: 0.811  
0.686

| MODE      | FRACTIONAL POWER | POWER HP | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | HC MASS LBS. | FUEL MASS LBS. | LB HC / 1K LB FUEL | ENERGY HP-HR | LB HC / HP-HR |
|-----------|------------------|----------|---------------------|-----------------|-----------------|-------------------|--------------|----------------|--------------------|--------------|---------------|
| TAXI-IDLE | 0.030            | 137.7    | 1.312               | 397.675         | 1.000           | 19.00             | 0.416        | 125.93         | 3.300              | 43.61        | 0.00953       |
| TAKEOFF   | 1.000            | 4591.0   | 0.089               | 2306.891        | 1.000           | 0.50              | 0.001        | 19.22          | 0.039              | 38.26        | 0.00002       |
| CLIMBOUT  | 0.900            | 4131.9   | 0.096               | 2104.478        | 1.000           | 2.50              | 0.004        | 87.69          | 0.046              | 172.16       | 0.00002       |
| APPROACH  | 0.300            | 1377.3   | 0.081               | 1139.468        | 1.000           | 4.50              | 0.006        | 85.46          | 0.071              | 103.30       | 0.00006       |
| TAXI-IDLE | 0.030            | 137.7    | 1.312               | 397.675         | 1.000           | 7.00              | 0.153        | 46.40          | 3.300              | 16.07        | 0.00953       |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 0.579  
LBS POLLUTANT/1K HP-HR/CYCLE: 1.589  
LBS POLLUTANT/1000K HP AT T.O.: 1.552  
0.161

| MODE      | FRACTIONAL POWER | POWER HP | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | NOX MASS LBS. | FUEL MASS LBS. | LB NOX / 1K LB FUEL | ENERGY HP-HR | LB NOX / HP-HR |
|-----------|------------------|----------|---------------------|-----------------|-----------------|-------------------|---------------|----------------|---------------------|--------------|----------------|
| TAXI-IDLE | 0.030            | 137.7    | 0.282               | 397.675         | 1.000           | 19.00             | 0.089         | 125.93         | 0.710               | 43.61        | 0.00205        |
| TAKEOFF   | 1.000            | 4591.0   | 17.370              | 2306.891        | 1.000           | 0.50              | 0.145         | 19.22          | 7.529               | 38.26        | 0.00378        |
| CLIMBOUT  | 0.900            | 4131.9   | 15.906              | 2104.478        | 1.000           | 2.50              | 0.663         | 87.69          | 7.558               | 172.16       | 0.00385        |
| APPROACH  | 0.300            | 1377.3   | 6.038               | 1139.468        | 1.000           | 4.50              | 0.453         | 85.46          | 5.299               | 103.30       | 0.00438        |
| TAXI-IDLE | 0.030            | 137.7    | 0.282               | 397.675         | 1.000           | 7.00              | 0.033         | 46.40          | 0.710               | 16.07        | 0.00205        |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 1.383  
LBS POLLUTANT/1K HP-HR/CYCLE: 3.791  
LBS POLLUTANT/1000K HP AT T.O.: 3.703  
31.528

DATE: 6/18/71

TEST ORGANIZATION: ALLISON DIVISION

ENGINE SUPPLIER: ALLISON DIVISION

ENGINE DATA .....

CAL ID NUMBER: 28 ENGINE TYPE AND MODEL: T56-A15 SERIAL NUMBER: 8469

RATED HORSEPOWER: 4591.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 93.00

ATMOSPHERIC PRESSURE: START 28.80 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0102

RELATIVE HUMIDITY: 34.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 154.44, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

FINAL RUN

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 257.00             | 5                        | 13500.00         | -0.00                    | 732.00                  | 29.90    | 0.006800                            | -0.00                     | 1105.00                      |
| -0.00      | 2/ 1      | 2496.20            | 54                       | 13800.00         | -0.00                    | 1512.00                 | -0.00    | 0.014100                            | -0.00                     | 1610.00                      |
| -0.00      | 3/ 2      | 3525.30            | 76                       | 13800.00         | -0.00                    | 1925.00                 | 29.90    | 0.017900                            | -0.00                     | 1850.00                      |
| -0.00      | 4/ 3      | 3744.20            | 81                       | 13800.00         | -0.00                    | 2020.00                 | 29.83    | 0.018800                            | -0.00                     | 1920.00                      |
| -0.00      | 5/ 4      | 3919.40            | 85                       | 13800.00         | -0.00                    | 2090.00                 | 29.76    | 0.019500                            | -0.00                     | 1970.00                      |
| -0.00      | 6/ 5      | 3975.60            | 21                       | 14300.00         | -0.00                    | 1040.00                 | 27.05    | 0.010700                            | -0.00                     | 1410.00                      |
| -0.00      | 7/ 6      | 850.50             | 18                       | 13400.00         | -0.00                    | 918.00                  | 29.65    | 0.008600                            | -0.00                     | 1255.00                      |
| -0.00      | 9/ 7      | 3919.40            | 85                       | 13800.00         | -0.00                    | 2100.00                 | 29.83    | 0.019600                            | -0.00                     | 1970.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (WET) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | -0.00                      | -0.00                     | 55.00         | 1.55                 | 15.00          | -0.00         | -0.00           | 30.00           | -0.00     | 50.00 | -0.00        |
| 54                       | -0.00                      | -0.00                     | 32.00         | 3.28                 | 9.00           | -0.00         | -0.00           | 108.00          | -0.00     | 52.00 | -0.00        |
| 76                       | -0.00                      | -0.00                     | 34.00         | 4.10                 | 3.00           | -0.00         | -0.00           | 129.00          | -0.00     | 54.00 | -0.00        |
| 81                       | -0.00                      | -0.00                     | 32.00         | 4.65                 | 2.00           | -0.00         | -0.00           | 129.00          | -0.00     | 54.00 | -0.00        |
| 85                       | -0.00                      | -0.00                     | 35.00         | 4.71                 | 4.00           | -0.00         | -0.00           | 153.00          | -0.00     | 54.00 | -0.00        |
| 21                       | -0.00                      | -0.00                     | 35.00         | 2.75                 | 3.00           | -0.00         | -0.00           | 77.00           | -0.00     | 53.00 | -0.00        |
| 18                       | -0.00                      | -0.00                     | 49.00         | 2.11                 | 1.00           | -0.00         | -0.00           | 42.00           | -0.00     | 52.00 | -0.00        |
| 85                       | -0.00                      | -0.00                     | 38.00         | 4.42                 | 4.00           | -0.00         | -0.00           | 153.00          | -0.00     | 54.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 7.07                      | 1.12                      | -0.00                      | 3130.34                    | -0.00                     | 6.33                       | 5.17              | 0.82              | -0.00              | 2291.41            | -0.00             | 4.64               |
| 54                       | 1.95                      | 0.12                      | -0.00                      | 3140.57                    | -0.00                     | 10.81                      | 2.95              | 0.49              | -0.00              | 4748.54            | -0.00             | 16.35              |
| 76                       | 1.66                      | 0.09                      | -0.00                      | 3141.68                    | -0.00                     | 10.33                      | 3.19              | 0.17              | -0.00              | 6047.73            | -0.00             | 19.89              |
| 81                       | 1.18                      | 0.05                      | -0.00                      | 3142.22                    | -0.00                     | 9.11                       | 2.78              | 0.10              | -0.00              | 6347.28            | -0.00             | 18.41              |
| 85                       | 1.49                      | 0.10                      | -0.00                      | 3141.91                    | -0.00                     | 10.67                      | 3.11              | 0.21              | -0.00              | 6566.59            | -0.00             | 22.30              |
| 21                       | 2.54                      | 0.13                      | -0.00                      | 3140.18                    | -0.00                     | 9.19                       | 2.65              | 0.13              | -0.00              | 3265.78            | -0.00             | 9.56               |
| 18                       | 4.59                      | 0.05                      | -0.00                      | 3137.16                    | -0.00                     | 6.47                       | 4.22              | 0.05              | -0.00              | 2879.91            | -0.00             | 5.94               |
| 85                       | 1.72                      | 0.11                      | -0.00                      | 3141.53                    | -0.00                     | 11.37                      | 3.61              | 0.23              | -0.00              | 6597.20            | -0.00             | 23.87              |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 20.136         | 8915.992         | 3.193           | -0.000         | -0.000           | 18.040           |
| 54                       | 1.181          | 1902.307         | 0.196           | -0.000         | -0.000           | 6.548            |
| 76                       | 0.905          | 1715.522         | 0.048           | -0.000         | -0.000           | 5.643            |
| 81                       | 0.742          | 1695.231         | 0.028           | -0.000         | -0.000           | 4.916            |
| 85                       | 0.792          | 1675.406         | 0.054           | -0.000         | -0.000           | 5.689            |
| 21                       | 2.712          | 3347.461         | 0.137           | -0.000         | -0.000           | 9.798            |
| 18                       | 4.958          | 3386.136         | 0.059           | -0.000         | -0.000           | 6.980            |
| 85                       | 0.921          | 1683.218         | 0.058           | -0.000         | -0.000           | 6.091            |

CAL ID NUMBER: 28 ENGINE TYPE AND MODEL: T56-A15  
TEST ORGANIZATION: ALLISON DIVISION

SERIAL NUMBER: 8469

| MODE      | FRACTIONAL POWER | POWER HP | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | CO MASS LBS. | FUEL MASS LBS. | LB CO / 1K LB FUEL | ENERGY HP-HR | LB CO / HP-HR |
|-----------|------------------|----------|---------------------|-----------------|-----------------|-------------------|--------------|----------------|--------------------|--------------|---------------|
| TAXI-IDLE | 0.030            | 137.7    | 4.215               | 576.838         | 1.000           | 19.00             | 1.335        | 182.67         | 7.307              | 43.61        | 0.03060       |
| TAKEOFF   | 1.000            | 4591.0   | 2.583               | 2387.875        | 1.000           | 0.50              | 0.022        | 19.90          | 1.082              | 38.26        | 0.00056       |
| CLIMBOUT  | 0.900            | 4131.9   | 2.823               | 2186.542        | 1.000           | 2.50              | 0.118        | 91.11          | 1.291              | 172.16       | 0.00068       |
| APPROACH  | 0.300            | 1377.3   | 2.521               | 1144.479        | 1.000           | 4.50              | 0.189        | 85.84          | 2.203              | 103.30       | 0.00183       |
| TAXI-IDLE | 0.030            | 137.7    | 4.215               | 576.838         | 1.000           | 7.00              | 0.492        | 67.30          | 7.307              | 16.07        | 0.03060       |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.155  
LBS POLLUTANT/1K HP-HR/CYCLE: 4.822  
LBS POLLUTANT/1000K HP AT T.O.: 5.770  
0.469

| MODE      | FRACTIONAL POWER | POWER HP | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | HC MASS LBS. | FUEL MASS LBS. | LB HC / 1K LB FUEL | ENERGY HP-HR | LB HC / HP-HR |
|-----------|------------------|----------|---------------------|-----------------|-----------------|-------------------|--------------|----------------|--------------------|--------------|---------------|
| TAXI-IDLE | 0.030            | 137.7    | 2.087               | 576.838         | 1.000           | 19.00             | 0.661        | 182.67         | 3.618              | 43.61        | 0.01515       |
| TAKEOFF   | 1.000            | 4591.0   | 0.310               | 2387.875        | 1.000           | 0.50              | 0.003        | 19.90          | 0.130              | 38.26        | 0.00007       |
| CLIMBOUT  | 0.900            | 4131.9   | 0.249               | 2186.542        | 1.000           | 2.50              | 0.010        | 91.11          | 0.114              | 172.16       | 0.00006       |
| APPROACH  | 0.300            | 1377.3   | 0.123               | 1144.479        | 1.000           | 4.50              | 0.009        | 85.84          | 0.107              | 103.30       | 0.00009       |
| TAXI-IDLE | 0.030            | 137.7    | 2.087               | 576.838         | 1.000           | 7.00              | 0.243        | 67.30          | 3.618              | 16.07        | 0.01515       |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 0.927  
LBS POLLUTANT/1K HP-HR/CYCLE: 2.074  
LBS POLLUTANT/1000K HP AT T.O.: 2.481  
0.563

| MODE      | FRACTIONAL POWER | POWER HP | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | NOX MASS LBS. | FUEL MASS LBS. | LB NOX / 1K LB FUEL | ENERGY HP-HR | LB NOX / HP-HR |
|-----------|------------------|----------|---------------------|-----------------|-----------------|-------------------|---------------|----------------|---------------------|--------------|----------------|
| TAXI-IDLE | 0.030            | 137.7    | 1.975               | 576.838         | 1.000           | 19.00             | 0.625         | 182.67         | 3.423               | 43.61        | 0.01434        |
| TAKEOFF   | 1.000            | 4591.0   | 26.544              | 2387.875        | 1.000           | 0.50              | 0.221         | 19.90          | 11.116              | 38.26        | 0.00578        |
| CLIMBOUT  | 0.900            | 4131.9   | 23.634              | 2186.542        | 1.000           | 2.50              | 0.985         | 91.11          | 10.809              | 172.16       | 0.00572        |
| APPROACH  | 0.300            | 1377.3   | 8.856               | 1144.479        | 1.000           | 4.50              | 0.664         | 85.84          | 7.738               | 103.30       | 0.00643        |
| TAXI-IDLE | 0.030            | 137.7    | 1.975               | 576.838         | 1.000           | 7.00              | 0.230         | 67.30          | 3.423               | 16.07        | 0.01434        |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.726  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.101  
LBS POLLUTANT/1000K HP AT T.O.: 7.300  
48.182

DATE: 5/ 6/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 34 ENGINE TYPE AND MODEL: T76-G-410

SERIAL NUMRER: GE00790

RATED HORSEPOWER: 720.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MNT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5

FUEL H/C RATIO: 1.877

OPERATIONAL DATA .....

INLET AIP TEMPERATURE, DEGREES F: START 59.00 FINISH 59.00

ATMOSPHERIC PRESSURE: START 28.61 FINISH 28.61

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0066

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

| CLOCK TIME | TFST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TFMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 2.10               | 0                        | 27230.00         | -0.00                    | 71.00                   | 2.68     | 0.007700                            | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 142.80             | 19                       | 41730.00         | -0.00                    | 192.00                  | 6.50     | 0.008600                            | -0.00                     | -0.00                        |
| -0.00      | 6/ 2      | 282.40             | 39                       | 41730.00         | -0.00                    | 238.00                  | 6.47     | 0.010700                            | -0.00                     | -0.00                        |
| -0.00      | 11/ 6     | 431.60             | 59                       | 41730.00         | -0.00                    | 293.00                  | 6.45     | 0.013200                            | -0.00                     | -0.00                        |
| -0.00      | 16/11     | 571.20             | 79                       | 41730.00         | -0.00                    | 347.00                  | 6.38     | 0.015800                            | -0.00                     | -0.00                        |
| -0.00      | 20/16     | 666.40             | 92                       | 41730.00         | -0.00                    | 387.00                  | 6.33     | 0.017800                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 673.00                     | -0.00                     | 482.20        | 1.61                 | 564.10         | 1.90          | 12.10           | 14.00           | -0.00     | -0.00 | -0.00        |
| 19                       | 622.00                     | -0.00                     | 223.70        | 1.86                 | 91.40          | 12.60         | 29.30           | 42.00           | -0.00     | -0.00 | -0.00        |
| 39                       | 708.00                     | -0.00                     | 190.20        | 2.29                 | 39.90          | 27.50         | 29.30           | 56.80           | -0.00     | -0.00 | -0.00        |
| 59                       | 815.00                     | -0.00                     | 151.50        | 2.65                 | 9.20           | 50.70         | 22.10           | 72.80           | -0.00     | -0.00 | -0.00        |
| 79                       | 930.00                     | -0.00                     | 91.10         | 3.09                 | 2.70           | 80.80         | 11.70           | 92.50           | -0.00     | -0.00 | -0.00        |
| 92                       | 1010.00                    | -0.00                     | 38.90         | 3.44                 | 1.40           | 98.10         | 8.70            | 106.80          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 56.56                     | 37.96                     | 2.34                       | 2972.55                    | 0.37                      | 2.70                       | 4.02              | 2.70              | 0.17               | 211.05             | 0.03              | 0.19               |
| 19                       | 73.75                     | 5.58                      | 5.13                       | 3113.11                    | 2.20                      | 7.35                       | 4.56              | 1.07              | 0.98               | 597.72             | 0.42              | 1.41               |
| 39                       | 16.57                     | 1.99                      | 4.19                       | 3134.24                    | 7.93                      | 8.13                       | 3.94              | 0.47              | 1.00               | 745.95             | 0.94              | 1.93               |
| 59                       | 11.45                     | 0.40                      | 2.74                       | 3146.65                    | 6.29                      | 9.04                       | 3.35              | 0.12              | 0.80               | 921.97             | 1.84              | 2.65               |
| 79                       | 5.92                      | 0.08                      | 1.25                       | 3156.20                    | 8.63                      | 9.88                       | 2.06              | 0.03              | 0.43               | 1095.20            | 2.99              | 3.43               |
| 92                       | 2.28                      | 0.05                      | 0.84                       | 3162.02                    | 9.43                      | 10.26                      | 0.88              | 0.02              | 0.32               | 1223.70            | 3.65              | 3.97               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 0                        | 1915.717       | 100500.500       | 1283.528        | 12.399         | 78.960           | 91.359           |
| 19                       | 31.939         | 4185.698         | 7.497           | 2.964          | 6.893            | 9.881            |
| 39                       | 13.463         | 2441.461         | 1.678           | 3.316          | 3.533            | 6.849            |
| 59                       | 7.773          | 2136.164         | 0.270           | 4.272          | 1.862            | 6.135            |
| 79                       | 3.598          | 1917.368         | 0.050           | 5.241          | 0.759            | 6.000            |
| 92                       | 1.322          | 1836.290         | 0.027           | 5.474          | 0.485            | 5.960            |

CAL ID NUMBER: 34 ENGINE TYPE AND MODEL: T76-G-410  
TEST ORGANIZATION: AIRESEARCH

SERIAL NUMBER: GE00790

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.060               | 43.2        | 6.331                     | 150.239               | 1.000              | 19.00                   | 2.005              | 47.58                | 42.136                | 13.68           | 0.14654          |
| TAKEOFF                         | 1.000               | 720.0       | 0.281                     | 409.537               | 1.000              | 0.50                    | 0.002              | 3.41                 | 0.687                 | 6.00            | 0.00039          |
| CLIMBOUT                        | 0.900               | 648.0       | 1.169                     | 380.229               | 1.000              | 2.50                    | 0.049              | 15.84                | 3.075                 | 27.00           | 0.00180          |
| APPROACH                        | 0.300               | 216.0       | 4.254                     | 216.995               | 1.000              | 4.50                    | 0.319              | 16.27                | 19.604                | 16.20           | 0.01969          |
| TAXI-IDLE                       | 0.060               | 43.2        | 6.331                     | 150.239               | 1.000              | 7.00                    | 0.739              | 17.53                | 42.136                | 5.04            | 0.14654          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 3.113              | 100.63               |                       | 67.92           |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 30.937             |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 45.838             |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.326              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.060               | 43.2        | 2.563                     | 150.239               | 1.000              | 19.00                   | 0.812              | 47.58                | 17.058                | 13.68           | 0.05933          |
| TAKEOFF                         | 1.000               | 720.0       | 0.0                       | 409.537               | 1.000              | 0.50                    | 0.0                | 3.41                 | 0.0                   | 6.00            | 0.0              |
| CLIMBOUT                        | 0.900               | 648.0       | 0.009                     | 380.229               | 1.000              | 2.50                    | 0.000              | 15.84                | 0.025                 | 27.00           | 0.00001          |
| APPROACH                        | 0.300               | 216.0       | 0.737                     | 216.995               | 1.000              | 4.50                    | 0.055              | 16.27                | 3.398                 | 16.20           | 0.00341          |
| TAXI-IDLE                       | 0.060               | 43.2        | 2.563                     | 150.239               | 1.000              | 7.00                    | 0.299              | 17.53                | 17.058                | 5.04            | 0.05932          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 1.166              | 100.63               |                       | 67.92           |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 11.589             |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 17.171             |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.0                |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.060               | 43.2        | 0.769                     | 150.239               | 1.000              | 19.00                   | 0.244               | 47.58                | 5.118                 | 13.68           | 0.01780          |
| TAKEOFF                         | 1.000               | 720.0       | 4.294                     | 409.537               | 1.000              | 0.50                    | 0.036               | 3.41                 | 10.484                | 6.00            | 0.00596          |
| CLIMBOUT                        | 0.900               | 648.0       | 3.863                     | 380.229               | 1.000              | 2.50                    | 0.161               | 15.84                | 10.160                | 27.00           | 0.00596          |
| APPROACH                        | 0.300               | 216.0       | 1.681                     | 216.995               | 1.000              | 4.50                    | 0.126               | 16.27                | 7.746                 | 16.20           | 0.00778          |
| TAXI-IDLE                       | 0.060               | 43.2        | 0.769                     | 150.239               | 1.000              | 7.00                    | 0.090               | 17.53                | 5.118                 | 5.04            | 0.01780          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 0.656               | 100.63               |                       | 67.92           |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 6.519               |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 9.659               |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 49.696              |                      |                       |                 |                  |

DATE: 5/11/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 33 ENGINE TYPE AND MODEL: TPE 331-43 A SERIAL NUMBER: P-61157

RATED HORSEPOWER: 575.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5

FUEL H/C RATIO: 1.877

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 91.00

ATMOSPHERIC PRESSURE: START 28.76 FINISH 28.76

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0044

RELATIVE HUMIDITY: 16.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 2.70               | 0                        | 35535.00               | -0.00                    | 101.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 6.30               | 1                        | 41730.00               | -0.00                    | 150.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 6/ 2      | 139.60             | 24                       | 41730.00               | -0.00                    | 197.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 11/ 6     | 266.60             | 46                       | 41730.00               | -0.00                    | 246.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 16/11     | 393.50             | 68                       | 41730.00               | -0.00                    | 293.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 20/16     | 498.20             | 86                       | 41730.00               | -0.00                    | 338.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WFT) PPMV | CO 2 (WET) PERCENT V | THC (WFT) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WFT) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 615.00                     | -0.00                     | 289.60        | 1.54                 | 369.00         | 4.60          | 13.20           | 17.80           | -0.00     | -0.00 | -0.00        |
| 1                        | 620.00                     | -0.00                     | 125.30        | 1.62                 | 24.50          | 21.30         | 19.60           | 40.40           | -0.00     | -0.00 | -0.00        |
| 24                       | 745.00                     | -0.00                     | 125.40        | 2.14                 | 12.00          | 37.80         | 25.50           | 63.30           | -0.00     | -0.00 | -0.00        |
| 46                       | 860.00                     | -0.00                     | 70.50         | 2.60                 | 2.70           | 69.10         | 15.80           | 84.90           | -0.00     | -0.00 | -0.00        |
| 68                       | 975.00                     | -0.00                     | 27.20         | 2.93                 | 2.10           | 97.30         | 8.00            | 105.30          | -0.00     | -0.00 | -0.00        |
| 86                       | 1090.00                    | -0.00                     | 13.60         | 3.40                 | 1.60           | 119.10        | 7.30            | 126.40          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 36.34                     | 26.52                     | 2.72                       | 3035.90                    | 0.95                      | 3.67                       | 3.67              | 2.68              | 0.27               | 306.63             | 0.10              | 0.37               |
| 1                        | 15.44                     | 1.73                      | 1.97                       | 3136.72                    | 4.31                      | 8.28                       | 2.32              | 0.26              | 0.60               | 470.51             | 0.65              | 1.24               |
| 24                       | 11.73                     | 0.64                      | 1.92                       | 3145.53                    | 5.81                      | 9.73                       | 2.31              | 0.13              | 0.77               | 619.67             | 1.14              | 1.92               |
| 46                       | 5.45                      | 0.12                      | 2.01                       | 3156.84                    | 8.77                      | 10.78                      | 1.34              | 0.03              | 0.49               | 776.58             | 2.16              | 2.65               |
| 68                       | 1.87                      | 0.08                      | 0.90                       | 3162.57                    | 10.98                     | 11.88                      | 0.55              | 0.07              | 0.26               | 926.63             | 3.22              | 3.48               |
| 86                       | 0.81                      | 0.05                      | 0.71                       | 3164.31                    | 11.59                     | 12.30                      | 0.27              | 0.02              | 0.24               | 1069.54            | 3.92              | 4.16               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 0                        | 1359.200       | 113564.875       | 991.874         | 35.462         | 101.761          | 137.223          |
| 1                        | 367.642        | 74683.813        | 41.170          | 102.653        | 94.460           | 197.114          |
| 24                       | 16.555         | 4438.891         | 0.907           | 8.157          | 5.529            | 11.726           |
| 46                       | 5.027          | 2912.914         | 0.110           | 8.053          | 1.851            | 9.464            |
| 68                       | 1.391          | 2354.845         | 0.062           | 8.175          | 0.672            | 8.847            |
| 86                       | 0.547          | 2146.805         | 0.037           | 7.862          | 0.482            | 8.343            |

CAL ID NUMBER: 33 ENGINE TYPE AND MODEL: TPE 331-43 A  
TEST ORGANIZATION: AIRESEARCH

SERIAL NUMBER: P-61157

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 34.5        | 4.270                     | 151.082               | 1.000              | 19.00                   | 1.352              | 47.84                | 28.263                | 10.92           | 0.12377          |
| TAKEOFF   | 1.000               | 575.0       | 0.081                     | 374.446               | 1.000              | 0.50                    | 0.001              | 3.12                 | 0.216                 | 4.79            | 0.00014          |
| CLIMBOUT  | 0.900               | 517.5       | 0.248                     | 349.374               | 1.000              | 2.50                    | 0.010              | 14.56                | 0.709                 | 21.56           | 0.00048          |
| APPROACH  | 0.300               | 172.5       | 2.150                     | 210.526               | 1.000              | 4.50                    | 0.161              | 15.79                | 10.213                | 12.94           | 0.01266          |
| TAXI-IDLE | 0.060               | 34.5        | 4.270                     | 151.082               | 1.000              | 7.00                    | 0.498              | 17.63                | 28.263                | 4.02            | 0.12377          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.023  
LBS POLLUTANT/1K HP-HR/CYCLE: 20.443  
LBS POLLUTANT/1000K HP AT T.O.: 0.117

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 34.5        | 1.506                     | 151.082               | 1.000              | 19.00                   | 0.477              | 47.84                | 9.971                 | 10.92           | 0.04367          |
| TAKEOFF   | 1.000               | 575.0       | 0.043                     | 374.446               | 1.000              | 0.50                    | 0.000              | 3.12                 | 0.114                 | 4.79            | 0.00007          |
| CLIMBOUT  | 0.900               | 517.5       | 0.040                     | 349.374               | 1.000              | 2.50                    | 0.002              | 14.56                | 0.114                 | 21.56           | 0.00008          |
| APPROACH  | 0.300               | 172.5       | 0.106                     | 210.526               | 1.000              | 4.50                    | 0.008              | 15.79                | 0.501                 | 12.94           | 0.00061          |
| TAXI-IDLE | 0.060               | 34.5        | 1.506                     | 151.082               | 1.000              | 7.00                    | 0.176              | 17.63                | 9.971                 | 4.02            | 0.04367          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 0.663  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.699  
LBS POLLUTANT/1000K HP AT T.O.: 0.619

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 34.5        | 0.932                     | 151.082               | 1.000              | 19.00                   | 0.295               | 47.84                | 6.171                 | 10.92           | 0.02703          |
| TAKEOFF   | 1.000               | 575.0       | 4.749                     | 374.446               | 1.000              | 0.50                    | 0.040               | 3.12                 | 12.682                | 4.79            | 0.00826          |
| CLIMBOUT  | 0.900               | 517.5       | 4.348                     | 349.374               | 1.000              | 2.50                    | 0.181               | 14.56                | 12.444                | 21.56           | 0.00840          |
| APPROACH  | 0.300               | 172.5       | 2.114                     | 210.526               | 1.000              | 4.50                    | 0.159               | 15.79                | 10.044                | 12.94           | 0.01226          |
| TAXI-IDLE | 0.060               | 34.5        | 0.932                     | 151.082               | 1.000              | 7.00                    | 0.109               | 17.63                | 6.171                 | 4.02            | 0.02703          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 0.783  
LBS POLLUTANT/1K HP-HR/CYCLE: 7.918  
LBS POLLUTANT/1000K HP AT T.O.: 68.822

DATE: 6/ 1/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 31 ENGINE TYPE AND MODEL: TPE 331-151 G SERIAL NUMBER: P-91165

RATED HORSEPOWER: 590.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 92.00 FINISH 92.00

ATMOSPHERIC PRESSURE: START 28.67 FINISH 28.67

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0028

RELATIVE HUMIDITY: 10.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

| CLOCK TIME | TEST MINF | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 1.00                     | 0                  | 27150.00         | -0.00                    | 75.00                   | 2.52     | 0.009000                            | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 3.10                     | 0                  | 41000.00         | -0.00                    | 137.00                  | 6.06     | 0.006800                            | -0.00                     | -0.00                        |
| -0.00      | 6/ 2      | 171.40                   | 29                 | 41730.00         | -0.00                    | 201.00                  | 6.12     | 0.009800                            | -0.00                     | -0.00                        |
| -0.00      | 11/ 6     | 361.80                   | 61                 | 41730.00         | -0.00                    | 265.00                  | 6.08     | 0.013000                            | -0.00                     | -0.00                        |
| -0.00      | 16/11     | 476.00                   | 80                 | 41730.00         | -0.00                    | 307.00                  | 6.04     | 0.015100                            | -0.00                     | -0.00                        |
| -0.00      | 20/16     | 596.60                   | 101                | 41730.00         | -0.00                    | 362.00                  | 5.96     | 0.018100                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 735.00                     | -0.00                     | 387.90        | 1.74                 | 549.30         | 3.10          | 7.90            | 11.00           | -0.00     | -0.00 | -0.00        |
| 0                        | 575.00                     | -0.00                     | 247.10        | 1.44                 | 138.10         | 6.10          | 13.80           | 19.90           | -0.00     | -0.00 | -0.00        |
| 29                       | 700.00                     | -0.00                     | 135.70        | 2.06                 | 76.80          | 19.10         | 13.10           | 32.20           | -0.00     | -0.00 | -0.00        |
| 61                       | 830.00                     | -0.00                     | 81.90         | 2.59                 | 11.20          | 32.70         | 9.10            | 41.90           | -0.00     | -0.00 | -0.00        |
| 80                       | 935.00                     | -0.00                     | 41.60         | 3.02                 | 8.70           | 47.80         | 6.30            | 54.20           | -0.00     | -0.00 | -0.00        |
| 101                      | 1050.00                    | -0.00                     | 16.40         | 3.45                 | 5.90           | 62.00         | 4.50            | 66.50           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOY LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 42.46                     | 34.44                     | 1.47                       | 2992.86                    | 0.56                      | 1.98                       | 3.18              | 2.58              | 0.11               | 224.46             | 0.04              | 0.15               |
| 0                        | 33.58                     | 10.74                     | 3.08                       | 3071.85                    | 1.36                      | 4.44                       | 4.60              | 1.47              | 0.42               | 420.84             | 0.19              | 0.61               |
| 29                       | 13.11                     | 2.04                      | 7.08                       | 3127.87                    | 3.03                      | 5.11                       | 2.64              | 0.41              | 0.42               | 628.70             | 0.61              | 1.03               |
| 61                       | 6.32                      | 0.50                      | 1.15                       | 3142.77                    | 4.15                      | 5.32                       | 1.68              | 0.13              | 0.31               | 832.83             | 1.10              | 1.41               |
| 80                       | 2.76                      | 0.33                      | 0.69                       | 3148.82                    | 5.21                      | 5.91                       | 0.85              | 0.10              | 0.21               | 966.69             | 1.60              | 1.81               |
| 101                      | 0.95                      | 0.20                      | 0.43                       | 3152.03                    | 5.92                      | 6.35                       | 0.35              | 0.07              | 0.16               | 1141.03            | 2.14              | 2.30               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 0                        | 3144.785       | 274464.750       | 2502.444        | 41.806         | 106.539          | 148.345          |
| 0                        | 1403.825       | 135756.000       | 476.567         | 60.119         | 136.006          | 196.124          |
| 29                       | 15.378         | 3668.043         | 7.384           | 3.555          | 2.438            | 5.994            |
| 61                       | 4.633          | 2301.919         | 0.363           | 3.038          | 0.845            | 3.893            |
| 80                       | 1.780          | 2030.856         | 0.213           | 3.360          | 0.443            | 3.810            |
| 101                      | 0.579          | 1912.562         | 0.119           | 3.593          | 0.261            | 3.854            |

CAL ID NUMBER: 31 ENGINE TYPE AND MODEL: TPE 331-151 G SERIAL NUMBER: P-91165  
TEST ORGANIZATION: AIRESEARCH

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 35.4        | 3.214                     | 127.414               | 1.000              | 19.00                   | 1.018              | 40.35                | 25.225                | 11.21           | 0.09079          |
| TAKEOFF   | 1.000               | 590.0       | 0.398                     | 355.748               | 1.000              | 0.50                    | 0.003              | 2.96                 | 1.118                 | 4.92            | 0.00067          |
| CLIMBOUT  | 0.900               | 531.0       | 0.581                     | 328.656               | 1.000              | 2.50                    | 0.024              | 13.69                | 1.768                 | 22.12           | 0.00109          |
| APPROACH  | 0.300               | 177.0       | 2.560                     | 197.618               | 1.000              | 4.50                    | 0.192              | 14.82                | 12.956                | 13.27           | 0.01446          |
| TAXI-IDLE | 0.060               | 35.4        | 3.214                     | 127.414               | 1.000              | 7.00                    | 0.375              | 14.86                | 25.225                | 4.13            | 0.09079          |

TOTAL FOR CYCLE: 1.612 86.69 55.66  
LBS POLLUTANT/1K LB FUEL/CYCLE: 18.998  
LBS POLLUTANT/1K HP-HR/CYCLE: 28.969  
LBS POLLUTANT/1000K HP AT T.O.: 0.562

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 35.4        | 0.764                     | 127.414               | 1.000              | 19.00                   | 0.242              | 40.35                | 5.999                 | 11.21           | 0.02159          |
| TAKEOFF   | 1.000               | 590.0       | 0.122                     | 355.748               | 1.000              | 0.50                    | 0.001              | 2.96                 | 0.344                 | 4.92            | 0.00021          |
| CLIMBOUT  | 0.900               | 531.0       | 0.118                     | 328.656               | 1.000              | 2.50                    | 0.005              | 13.69                | 0.360                 | 22.12           | 0.00022          |
| APPROACH  | 0.300               | 177.0       | 0.352                     | 197.618               | 1.000              | 4.50                    | 0.026              | 14.82                | 1.781                 | 13.27           | 0.00199          |
| TAXI-IDLE | 0.060               | 35.4        | 0.764                     | 127.414               | 1.000              | 7.00                    | 0.089              | 14.86                | 5.999                 | 4.13            | 0.02159          |

TOTAL FOR CYCLE: 0.364 86.69 55.66  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.194  
LBS POLLUTANT/1K HP-HR/CYCLE: 6.532  
LBS POLLUTANT/1000K HP AT T.O.: 1.730

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 35.4        | 0.606                     | 127.414               | 1.000              | 19.00                   | 0.192               | 40.35                | 4.757                 | 11.21           | 0.01712          |
| TAKEOFF   | 1.000               | 590.0       | 2.245                     | 355.748               | 1.000              | 0.50                    | 0.019               | 2.96                 | 6.310                 | 4.92            | 0.00380          |
| CLIMBOUT  | 0.900               | 531.0       | 2.012                     | 328.656               | 1.000              | 2.50                    | 0.084               | 13.69                | 6.121                 | 22.12           | 0.00379          |
| APPROACH  | 0.300               | 177.0       | 1.009                     | 197.618               | 1.000              | 4.50                    | 0.076               | 14.82                | 5.103                 | 13.27           | 0.00570          |
| TAXI-IDLE | 0.060               | 35.4        | 0.606                     | 127.414               | 1.000              | 7.00                    | 0.071               | 14.86                | 4.757                 | 4.13            | 0.01712          |

TOTAL FOR CYCLE: 0.441 86.69 55.66  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.085  
LBS POLLUTANT/1K HP-HR/CYCLE: 7.920  
LBS POLLUTANT/1000K HP AT T.O.: 31.704

DATE: 4/10/71

TEST ORGANIZATION: AIRSEARCH

ENGINE SUPPLIER: AIRSEARCH

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 32 ENGINE TYPE AND MODEL: TPF 331-151 G SERIAL NUMBER: .P91168

RATED HORSEPOWER: 590.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.928

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 28.75 FINISH 28.75

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0028

RELATIVE HUMIDITY: 11.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

CONCENTRATION DATA REPORTED WET

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATIO T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 4.10               | 0                        | 27200.00         | -0.00                    | 77.00                   | 0.008900 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 9.50               | 1                        | 41730.00         | -0.00                    | 150.00                  | 0.007200 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 6/ 2      | 158.70             | 26                       | 41730.00         | -0.00                    | 198.00                  | 0.009500 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 11/ 6     | 317.30             | 53                       | 41730.00         | -0.00                    | 255.00                  | 0.012500 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 16/11     | 476.00             | 80                       | 41730.00         | -0.00                    | 317.00                  | 0.015700 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 20/16     | 596.60             | 101                      | 41730.00         | -0.00                    | 369.00                  | 0.018500 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 698.00                     | -0.00                     | 180.80        | 1.62                 | 1037.40        | 4.40          | 12.20           | 16.60           | -0.00     | -0.00 | -0.00        |
| 1                        | 590.00                     | -0.00                     | 162.00        | 1.44                 | 53.60          | 14.90         | 20.80           | 35.70           | -0.00     | -0.00 | -0.00        |
| 26                       | 700.00                     | -0.00                     | 140.50        | 1.87                 | 26.20          | 30.90         | 21.10           | 52.00           | -0.00     | -0.00 | -0.00        |
| 53                       | 825.00                     | -0.00                     | 103.00        | 2.37                 | 6.10           | 49.90         | 21.00           | 70.90           | -0.00     | -0.00 | -0.00        |
| 80                       | 960.00                     | -0.00                     | 50.00         | 3.14                 | 3.00           | 88.30         | 10.80           | 99.10           | -0.00     | -0.00 | -0.00        |
| 101                      | 1080.70                    | -0.00                     | 34.80         | 3.64                 | 1.30           | 111.80        | 7.40            | 119.20          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 43.39                     | 67.70                     | 2.28                       | 2900.17                    | 0.87                      | 3.11                       | 3.34              | 5.21              | 0.18               | 223.31             | 0.06              | 0.24               |
| 1                        | 22.25                     | 4.72                      | 4.69                       | 3107.54                    | 3.36                      | 8.05                       | 1.34              | 0.63              | 0.70               | 466.13             | 0.50              | 1.21               |
| 26                       | 14.95                     | 1.50                      | 3.69                       | 3126.20                    | 5.40                      | 9.09                       | 2.96              | 0.32              | 0.73               | 618.99             | 1.07              | 1.80               |
| 53                       | 8.68                      | 0.29                      | 2.91                       | 3139.61                    | 6.91                      | 9.82                       | 2.21              | 0.09              | 0.74               | 800.60             | 1.76              | 2.50               |
| 80                       | 3.19                      | 0.11                      | 1.11                       | 3148.75                    | 9.26                      | 10.39                      | 1.01              | 0.03              | 0.36               | 998.15             | 2.93              | 3.29               |
| 101                      | 1.92                      | 0.04                      | 0.67                       | 3150.94                    | 10.12                     | 10.79                      | 0.71              | 0.02              | 0.25               | 1162.70            | 3.73              | 3.98               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 0                        | 814.844        | 54466.680        | 1271.153        | 15.445         | 42.880           | 58.345           |
| 1                        | 351.316        | 49066.422        | 66.577          | 53.075         | 74.091           | 127.166          |
| 26                       | 18.451         | 3970.359         | 1.992           | 6.738          | 4.601            | 11.338           |
| 53                       | 6.979          | 2521.169         | 0.217           | 5.554          | 2.337            | 7.891            |
| 80                       | 2.125          | 2076.967         | 0.073           | 6.165          | 0.754            | 6.919            |
| 101                      | 1.186          | 1948.472         | 0.025           | 6.258          | 0.414            | 6.672            |

CAL ID NUMBER: 32 ENGINE TYPE AND MODEL: TPE 331-151 G  
TEST ORGANIZATION: AIRESEARCH

SERIAL NUMBER: P91168

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 35.4        | 3.116                     | 159.235               | 1.000              | 19.00                   | 0.987              | 50.42                | 19.566                | 11.21           | 0.08801          |
| TAKEOFF   | 1.000               | 590.0       | 0.700                     | 366.064               | 1.000              | 0.50                    | 0.006              | 3.05                 | 1.911                 | 4.92            | 0.00119          |
| CLIMBOUT  | 0.900               | 531.0       | 0.874                     | 339.250               | 1.000              | 2.50                    | 0.036              | 14.14                | 2.576                 | 22.12           | 0.00165          |
| APPROACH  | 0.300               | 177.0       | 3.035                     | 210.146               | 1.000              | 4.50                    | 0.228              | 15.76                | 14.442                | 13.27           | 0.01715          |
| TAXI-IDLE | 0.060               | 35.4        | 3.116                     | 159.235               | 1.000              | 7.00                    | 0.363              | 18.58                | 19.566                | 4.13            | 0.08801          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 1.620  
LBS POLLUTANT/1K HP-HR/CYCLE: 15.890  
LBS POLLUTANT/1000K HP AT T.O.: 29.107  
0.988

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 35.4        | 0.367                     | 159.235               | 1.000              | 19.00                   | 0.116              | 50.42                | 2.302                 | 11.21           | 0.01036          |
| TAKEOFF   | 1.000               | 590.0       | 0.0                       | 366.064               | 1.000              | 0.50                    | 0.0                | 3.05                 | 0.0                   | 4.92            | 0.0              |
| CLIMBOUT  | 0.900               | 531.0       | 0.0                       | 339.250               | 1.000              | 2.50                    | 0.0                | 14.14                | 0.0                   | 22.12           | 0.0              |
| APPROACH  | 0.300               | 177.0       | 0.262                     | 210.146               | 1.000              | 4.50                    | 0.020              | 15.76                | 1.249                 | 13.27           | 0.00148          |
| TAXI-IDLE | 0.060               | 35.4        | 0.367                     | 159.235               | 1.000              | 7.00                    | 0.043              | 18.58                | 2.302                 | 4.13            | 0.01036          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 0.179  
LBS POLLUTANT/1K HP-HR/CYCLE: 1.751  
LBS POLLUTANT/1000K HP AT T.O.: 3.208  
0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE | 0.060               | 35.4        | 1.325                     | 159.235               | 1.000              | 19.00                   | 0.420               | 50.42                | 8.322                 | 11.21           | 0.03743          |
| TAKEOFF   | 1.000               | 590.0       | 3.922                     | 366.064               | 1.000              | 0.50                    | 0.033               | 3.05                 | 10.715                | 4.92            | 0.00665          |
| CLIMBOUT  | 0.900               | 531.0       | 3.580                     | 339.250               | 1.000              | 2.50                    | 0.149               | 14.14                | 10.552                | 22.12           | 0.00674          |
| APPROACH  | 0.300               | 177.0       | 1.932                     | 210.146               | 1.000              | 4.50                    | 0.145               | 15.76                | 9.193                 | 13.27           | 0.01091          |
| TAXI-IDLE | 0.060               | 35.4        | 1.325                     | 159.235               | 1.000              | 7.00                    | 0.155               | 18.58                | 8.322                 | 4.13            | 0.03743          |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 0.901  
LBS POLLUTANT/1K HP-HR/CYCLE: 8.837  
LBS POLLUTANT/1000K HP AT T.O.: 16.188  
55.399

DATE: 6/18/71

TFST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBR: 30 ENGINE TYPE AND MODEL: TSF 231-1 SERIAL NUMBER: 2301-10

RATED HORSEPOWER: 474.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.877

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 110.00 FINISH 110.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH 28.60

INLET AIR HUMIDITY, LBS H2O/LH AIR: 0.0059

RELATIVE HUMIDITY: 14.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 0.0                      | 0                  | 32001.00         | 33652.00                 | 68.50                   | 1.61     | 0.013000                            | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 0.0                      | 0                  | 37746.00         | 44982.00                 | 93.50                   | 2.20     | 0.012900                            | -0.00                     | -0.00                        |
| -0.00      | 6/ 2      | 71.70                    | 15                 | 41936.00         | 45004.00                 | 125.60                  | 2.72     | 0.014100                            | -0.00                     | -0.00                        |
| -0.00      | 11/ 6     | 157.80                   | 33                 | 45065.00         | 45011.00                 | 164.40                  | 3.13     | 0.016000                            | -0.00                     | -0.00                        |
| -0.00      | 16/11     | 210.20                   | 44                 | 46517.00         | 44967.00                 | 186.50                  | 3.35     | 0.017000                            | -0.00                     | -0.00                        |
| -0.00      | 20/16     | 257.90                   | 54                 | 47673.00         | 44946.00                 | 203.50                  | 3.52     | 0.017700                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 910.00                     | -0.00                     | 345.00        | 2.46                 | 99.00          | 16.80         | 14.40           | 31.20           | -0.00     | -0.00 | -0.00        |
| 0                        | 935.00                     | -0.00                     | 161.00        | 2.50                 | 21.50          | 31.00         | 11.50           | 42.50           | -0.00     | -0.00 | -0.00        |
| 15                       | 995.00                     | -0.00                     | 104.10        | 2.79                 | 11.80          | 55.10         | 10.70           | 65.90           | -0.00     | -0.00 | -0.00        |
| 33                       | 1070.00                    | -0.00                     | 75.70         | 3.05                 | 7.80           | 83.00         | 8.80            | 91.80           | -0.00     | -0.00 | -0.00        |
| 44                       | 1100.00                    | -0.00                     | 67.70         | 3.25                 | 8.10           | 103.00        | 8.70            | 111.70          | -0.00     | -0.00 | -0.00        |
| 54                       | 1120.00                    | -0.00                     | 61.40         | 3.59                 | 7.60           | 122.70        | 12.60           | 135.30          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HP | MASS EMI HC LB/HP | MASS EMI NO2 LB/HP | MASS EMI CO2 LB/HP | MASS EMI NO LB/HP | MASS EMI NOX LB/HP |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 27.76                     | 4.56                      | 1.90                       | 3109.60                    | 2.22                      | 4.12                       | 1.90              | 0.31              | 0.13               | 213.01             | 0.15              | 0.28               |
| 0                        | 12.88                     | 0.99                      | 1.51                       | 3142.79                    | 4.07                      | 5.59                       | 1.20              | 0.09              | 0.14               | 291.45             | 0.38              | 0.52               |
| 15                       | 7.49                      | 0.49                      | 1.26                       | 3152.63                    | 6.51                      | 7.78                       | 0.94              | 0.06              | 0.16               | 345.97             | 0.82              | 0.98               |
| 33                       | 4.99                      | 0.29                      | 0.95                       | 3157.09                    | 8.98                      | 9.93                       | 0.87              | 0.05              | 0.16               | 519.02             | 1.48              | 1.63               |
| 44                       | 3.88                      | 0.24                      | 0.88                       | 3158.85                    | 10.47                     | 11.35                      | 0.72              | 0.05              | 0.16               | 589.12             | 1.95              | 2.12               |
| 54                       | 3.44                      | 0.24                      | 1.16                       | 3159.66                    | 11.79                     | 12.45                      | 0.70              | 0.05              | 0.24               | 642.99             | 2.30              | 2.53               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 15                       | 13.115         | 5522.598         | 0.851           | 11.402         | 7.214            | 13.637           |
| 33                       | 5.196          | 3289.132         | 0.307           | 9.157          | 0.992            | 10.349           |
| 44                       | 7.441          | 2802.687         | 0.255           | 9.284          | 0.784            | 10.070           |
| 54                       | 2.714          | 2493.176         | 0.192           | 8.909          | 0.915            | 9.823            |

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

|    |        |          |       |        |       |        |
|----|--------|----------|-------|--------|-------|--------|
| 15 | 13.115 | 5522.598 | 0.851 | 11.402 | 7.214 | 13.637 |
| 33 | 5.196  | 3289.132 | 0.307 | 9.157  | 0.992 | 10.349 |
| 44 | 7.441  | 2802.687 | 0.255 | 9.284  | 0.784 | 10.070 |
| 54 | 2.714  | 2493.176 | 0.192 | 8.909  | 0.915 | 9.823  |

CAL ID NUMBER: 30 ENGINE TYPE AND MODEL: TSE 231-1  
TEST ORGANIZATION: AIRESEARCH

SERIAL NUMBER: 2301-10

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.060               | 28.4        | 0.486                     | 49.676                | 1.000              | 19.00                   | 0.154              | 15.73                | 9.788                 | 9.01            | 0.01710          |
| TAKEOFF                         | 1.000               | 474.0       | 0.287                     | 260.734               | 1.000              | 0.50                    | 0.002              | 2.17                 | 1.102                 | 3.95            | 0.00061          |
| CLIMBOUT                        | 0.900               | 426.6       | 0.400                     | 247.922               | 1.000              | 2.50                    | 0.017              | 10.33                | 1.615                 | 17.77           | 0.00094          |
| APPROACH                        | 0.300               | 142.2       | 0.853                     | 161.178               | 1.000              | 4.50                    | 0.064              | 12.09                | 5.292                 | 10.66           | 0.00600          |
| TAXI-IDLE                       | 0.060               | 28.4        | 0.486                     | 49.676                | 1.000              | 7.00                    | 0.057              | 5.80                 | 9.788                 | 3.32            | 0.01710          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 0.294              | 46.12                |                       | 44.71           |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 6.370              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 6.369              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.505              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.060               | 28.4        | 0.035                     | 49.676                | 1.000              | 19.00                   | 0.011              | 15.73                | 0.705                 | 9.01            | 0.00123          |
| TAKEOFF                         | 1.000               | 474.0       | 0.020                     | 260.734               | 1.000              | 0.50                    | 0.000              | 2.17                 | 0.078                 | 3.95            | 0.00004          |
| CLIMBOUT                        | 0.900               | 426.6       | 0.029                     | 247.922               | 1.000              | 2.50                    | 0.001              | 10.33                | 0.116                 | 17.77           | 0.00007          |
| APPROACH                        | 0.300               | 142.2       | 0.052                     | 161.178               | 1.000              | 4.50                    | 0.004              | 12.09                | 0.322                 | 10.66           | 0.00036          |
| TAXI-IDLE                       | 0.060               | 28.4        | 0.035                     | 49.676                | 1.000              | 7.00                    | 0.004              | 5.80                 | 0.705                 | 3.32            | 0.00123          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 0.020              | 46.12                |                       | 44.71           |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 0.443              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 0.457              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 0.356              |                      |                       |                 |                  |

| MODE                            | FRACTIONAL<br>POWER | POWER<br>HP | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|---------------------------------|---------------------|-------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                       | 0.060               | 28.4        | 0.148                     | 49.676                | 1.000              | 19.00                   | 0.047               | 15.73                | 2.982                 | 9.01            | 0.00521          |
| TAKEOFF                         | 1.000               | 474.0       | 4.514                     | 260.734               | 1.000              | 0.50                    | 0.038               | 2.17                 | 17.314                | 3.95            | 0.00952          |
| CLIMBOUT                        | 0.900               | 426.6       | 4.027                     | 247.922               | 1.000              | 2.50                    | 0.168               | 10.33                | 16.242                | 17.77           | 0.00944          |
| APPROACH                        | 0.300               | 142.2       | 1.544                     | 161.178               | 1.000              | 4.50                    | 0.116               | 12.09                | 9.581                 | 10.66           | 0.01086          |
| TAXI-IDLE                       | 0.060               | 28.4        | 0.148                     | 49.676                | 1.000              | 7.00                    | 0.017               | 5.80                 | 2.982                 | 3.32            | 0.00521          |
| TOTAL FOR CYCLE:                |                     |             |                           |                       |                    |                         | 0.385               | 46.12                |                       | 44.71           |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE: |                     |             |                           |                       |                    |                         | 8.357               |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE:   |                     |             |                           |                       |                    |                         | 8.619               |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP AT T.O.: |                     |             |                           |                       |                    |                         | 79.365              |                      |                       |                 |                  |

DATE: 7/20/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMRFR: 119 ENGINE TYPE AND MODEL: CJ-805-3A SERIAL NUMRFR: GE-161-302

RATED THRUST: 11200.

ENGINE TOTAL TIME: 19618. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 TF FUEL W/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 29.04 FINISH 29.04

INLET AIR HUMIDITY, LBS H2O/LR AIR: 0.0111

RELATIVE HUMIDITY: 56.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR LAST RUN. NO2 DETERMINED BY SUBTRACTION.

| FLAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 7720.00            | 68                       | 7080.00          | 7080.00                  | 6390.00                 | 145.00   | 0.012200                            | -0.00                     | 2.10                         |
| 5.00         | 2/ 1      | 8620.00            | 76                       | 7180.00          | 7180.00                  | 7220.00                 | 152.80   | 0.013100                            | -0.00                     | 2.24                         |
| 10.00        | 3/ 2      | 9620.00            | 85                       | 7280.00          | 7280.00                  | 8140.00                 | 156.50   | 0.014500                            | -0.00                     | 2.41                         |
| 17.00        | 4/ 3      | 400.00             | 3                        | 4490.00          | 4490.00                  | 1090.00                 | 36.00    | 0.008400                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 68                       | 957.00                     | 15.60                     | 57.00         | 2.51                 | 2.00           | 53.00         | 6.00            | 59.00           | -0.00     | -0.00 | -0.00        |
| 76                       | 1024.00                    | 17.70                     | 48.00         | 2.70                 | 0.0            | 62.00         | 7.00            | 69.00           | -0.00     | -0.00 | -0.00        |
| 85                       | 1100.00                    | 20.10                     | 45.00         | 2.89                 | 0.0            | 74.00         | 9.00            | 82.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 777.00                     | 0.40                      | 464.00        | 1.63                 | 302.00         | 1.00          | 8.00            | 9.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 68                       | 4.52                      | 0.09                      | 0.78                       | 3125.09                    | 6.90                      | 7.68                       | 28.37             | 0.58              | 4.99               | 19974.46           | 44.09             | 49.08              |
| 76                       | 3.54                      | 0.0                       | 0.85                       | 3127.68                    | 7.51                      | 8.36                       | 25.55             | 0.0               | 6.12               | 22581.85           | 54.21             | 60.33              |
| 85                       | 3.10                      | 0.0                       | 0.91                       | 3128.37                    | 8.37                      | 9.28                       | 25.74             | 0.0               | 7.37               | 25464.93           | 64.16             | 75.53              |
| 3                        | 54.22                     | 20.21                     | 1.54                       | 2992.61                    | 0.19                      | 1.73                       | 59.10             | 22.03             | 1.67               | 3261.94            | 0.21              | 1.88               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 68                       | 3.740          | 2597.365         | 0.075           | 5.711          | 0.647            | 6.358            |
| 76                       | 2.964          | 2619.774         | 0.0             | 6.289          | 0.710            | 6.999            |
| 85                       | 2.623          | 2647.042         | 0.0             | 7.086          | 0.766            | 7.852            |
| 3                        | 147.744        | 8154.855         | 55.073          | 0.523          | 4.184            | 4.707            |

CAL ID NUMBER: 119 ENGINE TYPE AND MODEL: CJ-805-3A  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: GE-161-302

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 48.149                    | 880.962               | 1.000              | 19.00                   | 15.247             | 278.97               | 54.655                | 141.87            | 0.10748            |
| TAKEOFF                            | 1.000               | 11200.0       | 26.189                    | 9801.957              | 1.000              | 0.70                    | 0.306              | 114.36               | 2.672                 | 130.67            | 0.00234            |
| CLIMBOUT                           | 0.850               | 9520.0        | 25.857                    | 8323.387              | 1.000              | 2.20                    | 0.948              | 305.19               | 3.107                 | 349.07            | 0.00272            |
| APPROACH                           | 0.400               | 4480.0        | 40.743                    | 3798.427              | 1.000              | 4.00                    | 2.716              | 253.23               | 10.726                | 298.67            | 0.00909            |
| TAXI-IDLE                          | 0.040               | 448.0         | 48.149                    | 880.962               | 1.000              | 7.00                    | 5.617              | 102.78               | 54.655                | 52.27             | 0.10748            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 24.835             | 1054.52              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 23.550             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 25.536             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.728              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 17.791                    | 880.962               | 1.000              | 19.00                   | 5.634              | 278.97               | 20.195                | 141.87            | 0.03971            |
| TAKEOFF                            | 1.000               | 11200.0       | 0.503                     | 9801.957              | 1.000              | 0.70                    | 0.006              | 114.36               | 0.051                 | 130.67            | 0.00004            |
| CLIMBOUT                           | 0.850               | 9520.0        | 1.243                     | 8323.387              | 1.000              | 2.20                    | 0.046              | 305.19               | 0.149                 | 349.07            | 0.00013            |
| APPROACH                           | 0.400               | 4480.0        | 1.688                     | 3798.427              | 1.000              | 4.00                    | 0.113              | 253.23               | 0.444                 | 298.67            | 0.00038            |
| TAXI-IDLE                          | 0.040               | 448.0         | 17.791                    | 880.962               | 1.000              | 7.00                    | 2.076              | 102.78               | 20.195                | 52.27             | 0.03971            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.873              | 1054.52              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.466              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.096              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.524              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 1.521                     | 880.962               | 1.000              | 19.00                   | 0.482               | 278.97               | 1.726                  | 141.87            | 0.00339             |
| TAKEOFF                            | 1.000               | 11200.0       | 104.398                   | 9801.957              | 1.000              | 0.70                    | 1.218               | 114.36               | 10.651                 | 130.67            | 0.00932             |
| CLIMBOUT                           | 0.850               | 9520.0        | 79.004                    | 8323.387              | 1.000              | 2.20                    | 2.897               | 305.19               | 9.492                  | 349.07            | 0.00830             |
| APPROACH                           | 0.400               | 4480.0        | 18.462                    | 3798.427              | 1.000              | 4.00                    | 1.231               | 253.23               | 4.860                  | 298.67            | 0.00412             |
| TAXI-IDLE                          | 0.040               | 448.0         | 1.521                     | 880.962               | 1.000              | 7.00                    | 0.177               | 102.78               | 1.726                  | 52.27             | 0.00339             |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.004               | 1054.52              |                        | 972.53            |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.694               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.174               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 108.748             |                      |                        |                   |                     |

DATE: 7/20/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 120 ENGINE TYPE AND MODFL: CJ-805-3A SERIAL NUMBER: GF-161-302

RATED THRUST: 11200.

ENGINE TOTAL TIME: 19618. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 29.03 FINISH 29.02

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0121

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.60

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 7720.00                  | 68                 | 7100.00          | 7100.00 | 6390.00 | 144.90                   | 0.012200                | -0.00    | -0.00                               | -0.00                     |                              |
| 5.00         | 2/ 1      | 8660.00                  | 77                 | 7210.00          | 7210.00 | 7480.00 | 153.00                   | 0.013600                | -0.00    | -0.00                               | -0.00                     |                              |
| 8.50         | 3/ 2      | 9800.00                  | 87                 | 7650.00          | 7650.00 | 8370.00 | 160.10                   | 0.014500                | -0.00    | -0.00                               | -0.00                     |                              |
| 13.00        | 4/ 3      | 380.00                   | 3                  | 4490.00          | 4490.00 | 1080.00 | 38.00                    | 0.007900                | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOX (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 68                       | 959.00                     | 15.50                     | 52.00         | 2.34                | 4.00           | 52.00         | 5.00           | 57.00          | -0.00     | -0.00 | -0.00        |
| 77                       | 1045.00                    | 17.70                     | 43.00         | 2.62                | 0.0            | 64.00         | 7.00           | 71.00          | -0.00     | -0.00 | -0.00        |
| 87                       | 1126.00                    | 20.20                     | 43.00         | 2.91                | 0.0            | 81.00         | 6.00           | 87.00          | -0.00     | -0.00 | -0.00        |
| 3                        | 734.00                     | 0.40                      | 397.00        | 1.52                | 353.00         | 1.00          | 7.00           | 8.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/FUEL | MASS EMI HC LB/FUEL | MASS EMI NO2 LB/FUEL | MASS FMI CO2 LB/FUEL | MASS EMI NO LB/FUEL | MASS FMI NOX LB/FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 68                       | 4.42                | 0.19                | 0.70                 | 3125.76              | 7.26                | 7.96                 | 28.25             | 1.24              | 4.46               | 19973.61           | 46.40             | 50.86              |
| 77                       | 3.27                | 0.0                 | 0.87                 | 3128.11              | 7.99                | 8.86                 | 24.44             | 0.0               | 6.54               | 23398.23           | 59.75             | 66.29              |
| 87                       | 2.94                | 0.0                 | 0.67                 | 3128.62              | 9.10                | 9.78                 | 24.63             | 0.0               | 5.64               | 26186.54           | 76.20             | 81.84              |
| 3                        | 49.63               | 25.28               | 1.44                 | 2985.91              | 0.21                | 1.64                 | 53.61             | 27.30             | 1.55               | 3224.78            | 0.22              | 1.77               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO2 LB/1K#TH-HR | NOX LB/1K#TH-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 68                       | 3.659          | 2587.255        | 0.161           | 6.010          | 0.578           | 6.588           |
| 77                       | 2.822          | 2701.875        | 0.0             | 6.900          | 0.755           | 7.654           |
| 87                       | 2.513          | 2672.096        | 0.0             | 7.775          | 0.576           | 8.351           |
| 3                        | 141.067        | 9486.270        | 71.838          | 0.584          | 4.086           | 4.669           |

CAL ID NUMBER: 120 ENGINE TYPE AND MODEL: CJ-805-3A  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: GE-161-302

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 46.922                    | 942.369               | 1.000              | 19.00                   | 14.859             | 298.42               | 49.792                | 141.87            | 0.10474            |
| TAKEOFF                            | 1.000               | 11200.0       | 28.201                    | 10254.902             | 1.000              | 0.70                    | 0.329              | 119.64               | 2.750                 | 130.67            | 0.00252            |
| CLIMBOUT                           | 0.850               | 9520.0        | 25.301                    | 8579.902              | 1.000              | 2.20                    | 0.928              | 314.60               | 2.949                 | 349.07            | 0.00266            |
| APPROACH                           | 0.400               | 4480.0        | 34.332                    | 3437.208              | 1.000              | 4.00                    | 2.289              | 229.15               | 9.988                 | 298.67            | 0.00766            |
| TAXI-IDLE                          | 0.040               | 448.0         | 46.922                    | 942.369               | 1.000              | 7.00                    | 5.474              | 109.94               | 49.792                | 52.27             | 0.10474            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 23.878             | 1071.74              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 22.280             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 24.553             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.938              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 23.402                    | 942.369               | 1.000              | 19.00                   | 7.411              | 298.42               | 24.833                | 141.87            | 0.05224            |
| TAKEOFF                            | 1.000               | 11200.0       | 0.012                     | 10254.902             | 1.000              | 0.70                    | 0.000              | 119.64               | 0.001                 | 130.67            | 0.00000            |
| CLIMBOUT                           | 0.850               | 9520.0        | 0.389                     | 8579.902              | 1.000              | 2.20                    | 0.014              | 314.60               | 0.045                 | 349.07            | 0.00004            |
| APPROACH                           | 0.400               | 4480.0        | 4.175                     | 3437.208              | 1.000              | 4.00                    | 0.278              | 229.15               | 1.215                 | 298.67            | 0.00093            |
| TAXI-IDLE                          | 0.040               | 448.0         | 23.402                    | 942.369               | 1.000              | 7.00                    | 2.730              | 109.94               | 24.833                | 52.27             | 0.05224            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.433             | 1071.74              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 9.735              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 10.728             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.013              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 1.570                     | 942.369               | 1.000              | 19.00                   | 0.497               | 298.42               | 1.666                 | 141.87            | 0.00350            |
| TAKEOFF                            | 1.000               | 11200.0       | 115.527                   | 10254.902             | 1.000              | 0.70                    | 1.348               | 119.64               | 11.265                | 130.67            | 0.01031            |
| CLIMBOUT                           | 0.850               | 9520.0        | 84.564                    | 8579.902              | 1.000              | 2.20                    | 3.101               | 314.60               | 9.856                 | 349.07            | 0.00888            |
| APPROACH                           | 0.400               | 4480.0        | 17.023                    | 3437.208              | 1.000              | 4.00                    | 1.135               | 229.15               | 4.953                 | 298.67            | 0.00380            |
| TAXI-IDLE                          | 0.040               | 448.0         | 1.570                     | 942.369               | 1.000              | 7.00                    | 0.183               | 109.94               | 1.666                 | 52.27             | 0.00350            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.264               | 1071.74              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.844               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.441               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 120.340             |                      |                       |                   |                    |

DATE: 7/26/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 281 ENGINE TYPE AND MODEL: CJ-805-3A SERIAL NUMBER: GE-161-156

RATED THRUST: 11200.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 64.00 FINISH 65.00

ATMOSPHERIC PRESSURE: START 29.01 FINISH 29.01

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0099

RELATIVE HUMIDITY: 73.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION ON 4TH RUN. NO2  
DETERMINED BY SUBTRACTION.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 | ENGINE<br>SPEED<br>RPM<br>N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPK | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------------|------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 8360.00                           | 74                       | 7090.00                      | 7090.00                      | 6790.00                           | 153.60                        | 0.012300    | -0.00                                        | 2.20                               | -0.00                                 |
| 9.00            | 2/ 1         | 9100.00                           | 81                       | 7180.00                      | 7180.00                      | 7480.00                           | 156.80                        | 0.013200    | -0.00                                        | 2.28                               | -0.00                                 |
| 16.00           | 3/ 2         | 10120.00                          | 90                       | 7370.00                      | 7370.00                      | 8620.00                           | 163.00                        | 0.014700    | -0.00                                        | 2.47                               | -0.00                                 |
| 20.00           | 4/ 3         | 400.00                            | 3                        | 4530.00                      | 4530.00                      | 1060.00                           | 32.40                         | 0.009100    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CC<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 74                                | 968.00                              | 17.00                              | 60.00               | 2.58                          | 0.0                  | 51.00               | 2.00                     | 53.00                    | -0.00     | -0.00 | -0.00        |
| 81                                | 1031.00                             | 18.70                              | 51.00               | 2.63                          | 0.0                  | 55.00               | 2.00                     | 57.00                    | -0.00     | -0.00 | -0.00        |
| 90                                | 1130.00                             | 21.00                              | 48.00               | 2.90                          | 0.0                  | 81.00               | 3.00                     | 84.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | 716.00                              | 0.50                               | 573.00              | 1.77                          | 325.00               | 3.00                | 8.00                     | 11.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 74                                | 4.63                               | 0.0                                | 0.25                                | 3125.97                             | 6.46                               | 6.71                                | 31.42                   | 0.0                     | 1.72                     | 21225.34                 | 43.86                   | 45.58                    |
| 81                                | 3.36                               | 0.0                                | 0.25                                | 3127.18                             | 6.84                               | 7.09                                | 28.87                   | 0.0                     | 1.86                     | 23391.28                 | 51.14                   | 53.00                    |
| 90                                | 3.30                               | 0.0                                | 0.34                                | 3128.06                             | 9.13                               | 9.47                                | 28.40                   | 0.0                     | 2.92                     | 26963.91                 | 78.73                   | 81.65                    |
| 3                                 | 61.44                              | 19.96                              | 1.41                                | 2981.95                             | 0.53                               | 1.94                                | 65.13                   | 21.16                   | 1.49                     | 3160.87                  | 0.56                    | 2.05                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 74                                | 3.758             | 2518.917               | 0.0                | 5.247             | 0.206                  | 5.452                  |
| 81                                | 3.172             | 2570.470               | 0.0                | 5.620             | 0.204                  | 5.824                  |
| 90                                | 7.807             | 2664.419               | 0.0                | 7.780             | 0.288                  | 8.068                  |
| 3                                 | 162.813           | 7902.172               | 52.889             | 1.400             | 3.734                  | 5.134                  |



DATE: 8/4/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 309 ENGINE TYPE AND MODEL: CJ-805-3A SERIAL NUMBER: GE161 108

RATED THRUST: 11200.

ENGINE TOTAL TIME: 22738. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 29.06 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0153

RELATIVE HUMIDITY: 72.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE FIRST OF FOUR RUN ON THIS ENGINE THE FUEL USED DURING THIS TEST CONTAINED NO C1-2.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GFN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 8080.00            | 72                       | 7120.00          | 6670.00                  | 148.20                  | 0.012500 | -0.00                               | -0.00                     | -0.00                        |
| 4.00         | 2/ 1      | 8820.00            | 78                       | 7180.00          | 7300.00                  | 152.30                  | 0.013300 | -0.00                               | -0.00                     | -0.00                        |
| 10.00        | 3/ 2      | 10000.00           | 89                       | 7380.00          | 8590.00                  | 162.50                  | 0.014700 | -0.00                               | -0.00                     | -0.00                        |
| 15.00        | 4/ 3      | 400.00             | 3                        | 4510.00          | 1090.00                  | 43.90                   | 0.006900 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 72                       | 968.00                     | 16.50                     | 52.00         | 2.55                 | 0.0            | 53.00         | 7.00            | 60.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 1022.00                    | 17.90                     | 48.00         | 2.70                 | 0.0            | 61.00         | 5.00            | 66.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1128.00                    | 20.80                     | 46.00         | 2.96                 | 0.0            | 75.00         | 6.00            | 81.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 716.00                     | 0.50                      | 472.00        | 1.31                 | 340.00         | 3.00          | 4.00            | 7.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|
| 72                       | 4.06                      | 0.0                       | 0.90                       | 3126.87                    | 6.79                      | 7.69                       | 27.07                     | 0.0                       | 5.99                       | 20856.19                   | 45.32                     | 51.30                      |
| 78                       | 3.54                      | 0.0                       | 0.61                       | 3127.68                    | 7.39                      | 7.99                       | 25.83                     | 0.0                       | 4.42                       | 22832.06                   | 53.93                     | 58.35                      |
| 89                       | 3.09                      | 0.0                       | 0.66                       | 3128.38                    | 8.29                      | 8.95                       | 26.58                     | 0.0                       | 5.69                       | 26872.78                   | 71.18                     | 76.88                      |
| 3                        | 67.66                     | 27.91                     | 0.94                       | 2950.37                    | 0.71                      | 1.65                       | 73.75                     | 30.47                     | 1.03                       | 3215.90                    | 0.77                      | 1.80                       |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 72                       | 1.350          | 2581.211         | 0.0             | 5.608          | 0.741            | 6.349            |
| 78                       | 2.929          | 2588.669         | 0.0             | 6.114          | 0.501            | 6.615            |
| 89                       | 2.658          | 2697.278         | 0.0             | 7.118          | 0.569            | 7.688            |
| 3                        | 184.363        | 8039.742         | 76.060          | 1.925          | 2.566            | 4.491            |

CAL ID NUMBER: 309 ENGINE TYPE AND MODEL: CJ-805-3A  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: GE161 108

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 70.769                    | 1085.125              | 1.000              | 19.00                   | 22.410             | 343.62               | 65.217                | 141.87            | 0.15797            |
| TAKEOFF   | 1.000               | 11200.0       | 25.349                    | 9531.477              | 1.000              | 0.70                    | 0.296              | 111.20               | 2.660                 | 130.67            | 0.00226            |
| CLIMBOUT  | 0.850               | 9520.0        | 26.794                    | 7993.285              | 1.000              | 2.20                    | 0.982              | 293.09               | 3.352                 | 349.07            | 0.00281            |
| APPROACH  | 0.400               | 4480.0        | 31.848                    | 3959.430              | 1.000              | 4.00                    | 2.123              | 263.96               | 8.044                 | 298.67            | 0.00711            |
| TAXI-IDLE | 0.040               | 448.0         | 70.769                    | 1085.125              | 1.000              | 7.00                    | 8.256              | 126.60               | 65.217                | 52.27             | 0.15797            |

TOTAL FOR CYCLE: 34.068 1138.47 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 29.924  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 35.030  
LBS POLLUTANT/1000K LB TH AT T.O.: 2.641

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 34.269                    | 1085.125              | 1.000              | 19.00                   | 10.852             | 343.62               | 31.581                | 141.87            | 0.07649            |
| TAKEOFF   | 1.000               | 11200.0       | 0.535                     | 9531.477              | 1.000              | 0.70                    | 0.006              | 111.20               | 0.056                 | 130.67            | 0.00005            |
| CLIMBOUT  | 0.850               | 9520.0        | 0.603                     | 7993.285              | 1.000              | 2.20                    | 0.022              | 293.09               | 0.075                 | 349.07            | 0.00006            |
| APPROACH  | 0.400               | 4480.0        | 1.867                     | 3959.430              | 1.000              | 4.00                    | 0.124              | 263.96               | 0.471                 | 298.67            | 0.00042            |
| TAXI-IDLE | 0.040               | 448.0         | 34.269                    | 1085.125              | 1.000              | 7.00                    | 3.998              | 126.60               | 31.581                | 52.27             | 0.07649            |

TOTAL FOR CYCLE: 15.003 1138.47 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 13.178  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 15.426  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.557

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 1.220                     | 1085.125              | 1.000              | 19.00                   | 0.386               | 343.62               | 1.125                 | 141.87            | 0.00272            |
| TAKEOFF   | 1.000               | 11200.0       | 100.352                   | 9531.477              | 1.000              | 0.70                    | 1.171               | 111.20               | 10.528                | 130.67            | 0.00896            |
| CLIMBOUT  | 0.850               | 9520.0        | 70.458                    | 7993.285              | 1.000              | 2.20                    | 2.583               | 293.09               | 8.815                 | 349.07            | 0.00740            |
| APPROACH  | 0.400               | 4480.0        | 18.434                    | 3959.430              | 1.000              | 4.00                    | 1.229               | 263.96               | 4.656                 | 298.67            | 0.00411            |
| TAXI-IDLE | 0.040               | 448.0         | 1.220                     | 1085.125              | 1.000              | 7.00                    | 0.142               | 126.60               | 1.125                 | 52.27             | 0.00272            |

TOTAL FOR CYCLE: 5.512 1138.47 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.842  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.668  
LBS POLLUTANT/1000K LB TH AT T.O.: 104.533

DATE: 8/ 4/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 310 ENGINE TYPE AND MODEL: CJ-805-3A SERIAL NUMBER: GE-161 108  
 RATED THRUST: 11200.  
 ENGINE TOTAL TIME: 22738. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS  
 FUEL: JP-4 TF FUEL W/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00  
 ATMOSPHERIC PRESSURE: START 29.05 FINISH 29.05  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0150  
 RELATIVE HUMIDITY: 68.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE SECOND OF FOUR TESTS ON THE SAME ENGINE. THE FUEL USED WAS TO CONTAIN THE NORMAS CONCENTRATION OF C1-2, BUT TWA HAD PROBLEMS WITH THE C1-2 PUMP, SO THE ACTUAL CONCENTRATION IS NOT KNOWN.

| ELAPSED TIME | TEST MODE | THRUST LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|-------------------|--------------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 8160.00           | 72                       | 7130.00 7130.00        | 6680.00                  | 147.50                  | 0.012800 | -0.00                               | -0.00                     | -0.00                        |
| 3.00         | 2/ 1      | 8820.00           | 78                       | 7180.00 7180.00        | 7290.00                  | 151.80                  | 0.013300 | -0.00                               | -0.00                     | -0.00                        |
| 6.00         | 3/ 2      | 10020.00          | 89                       | 7180.00 7180.00        | 8620.00                  | 162.10                  | 0.014800 | -0.00                               | -0.00                     | -0.00                        |
| 10.00        | 4/ 3      | 400.00            | 3                        | 4520.00 4520.00        | 1090.00                  | 44.50                   | 0.006800 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 72                       | 482.00                     | 16.70                     | 68.00         | 2.61                 | 0.0            | 55.00         | 3.00            | 58.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 1029.00                    | 17.90                     | 67.00         | 2.71                 | 0.0            | 61.00         | 2.00            | 63.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1137.00                    | 20.90                     | 60.00         | 2.97                 | 0.0            | 75.00         | 5.00            | 80.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 716.00                     | 0.50                      | 454.00        | 1.30                 | 337.00         | 3.00          | 5.00            | 8.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 72                       | 5.18                      | 0.0                       | 0.38                       | 3125.10                    | 6.88                      | 7.26                       | 34.62             | 0.0               | 2.51               | 20875.65           | 45.99             | 48.50              |
| 78                       | 4.92                      | 0.0                       | 0.24                       | 3125.51                    | 7.35                      | 7.60                       | 15.85             | 0.0               | 1.76               | 22785.00           | 53.62             | 55.37              |
| 89                       | 4.02                      | 0.0                       | 0.55                       | 3126.92                    | 8.25                      | 8.81                       | 34.66             | 0.0               | 4.76               | 26954.08           | 71.16             | 75.90              |
| 3                        | 65.65                     | 27.91                     | 1.19                       | 2953.53                    | 0.71                      | 1.90                       | 71.56             | 30.42             | 1.29               | 3219.35            | 0.78              | 2.07               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 72                       | 4.242          | 2558.291         | 0.0             | 5.636          | 0.307            | 5.943            |
| 78                       | 4.065          | 2583.333         | 0.0             | 6.079          | 0.199            | 6.278            |
| 89                       | 3.459          | 2690.028         | 0.0             | 7.101          | 0.473            | 7.575            |
| 3                        | 179.888        | 8048.363         | 76.050          | 1.942          | 3.236            | 5.178            |

CAL ID NUMBER: 310 ENGINE TYPE AND MODEL: CJ-805-3A  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: GE-161 108

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 72.159                    | 1130.329              | 1.000              | 19.00                   | 22.850             | 357.94               | 63.839                | 141.87            | 0.16107            |
| TAKEOFF   | 1.000               | 11200.0       | 30.102                    | 9888.805              | 1.000              | 0.70                    | 0.351              | 115.37               | 3.044                 | 130.67            | 0.00269            |
| CLIMBOUT  | 0.850               | 9520.0        | 32.194                    | 8193.301              | 1.000              | 2.20                    | 1.180              | 300.42               | 3.929                 | 349.07            | 0.00338            |
| APPROACH  | 0.400               | 4480.0        | 56.785                    | 3968.873              | 1.000              | 4.00                    | 3.786              | 264.59               | 14.308                | 298.67            | 0.01268            |
| TAXI-IDLE | 0.040               | 448.0         | 72.159                    | 1130.329              | 1.000              | 7.00                    | 8.419              | 131.87               | 63.839                | 52.27             | 0.16107            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 36.586  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1170.19  
LBS POLLUTANT/1000K LB TH AT T.O.: 972.53

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 29.828                    | 1130.329              | 1.000              | 19.00                   | 9.446              | 357.94               | 26.389                | 141.87            | 0.06658            |
| TAKEOFF   | 1.000               | 11200.0       | 0.0                       | 9888.805              | 1.000              | 0.70                    | 0.0                | 115.37               | 0.0                   | 130.67            | 0.0                |
| CLIMBOUT  | 0.850               | 9520.0        | 0.0                       | 8193.301              | 1.000              | 2.20                    | 0.0                | 300.42               | 0.0                   | 349.07            | 0.0                |
| APPROACH  | 0.400               | 4480.0        | 6.068                     | 3968.873              | 1.000              | 4.00                    | 0.405              | 264.59               | 1.529                 | 298.67            | 0.00135            |
| TAXI-IDLE | 0.040               | 448.0         | 29.828                    | 1130.329              | 1.000              | 7.00                    | 3.480              | 131.87               | 26.389                | 52.27             | 0.06658            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 13.330  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1170.19  
LBS POLLUTANT/1000K LB TH AT T.O.: 972.53

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 2.204                     | 1130.329              | 1.000              | 19.00                   | 0.698               | 357.94               | 1.950                 | 141.87            | 0.00492            |
| TAKEOFF   | 1.000               | 11200.0       | 100.271                   | 9888.805              | 1.000              | 0.70                    | 1.170               | 115.37               | 10.140                | 130.67            | 0.00895            |
| CLIMBOUT  | 0.850               | 9520.0        | 68.281                    | 8193.301              | 1.000              | 2.20                    | 2.504               | 300.42               | 8.334                 | 349.07            | 0.00717            |
| APPROACH  | 0.400               | 4480.0        | 20.651                    | 3968.873              | 1.000              | 4.00                    | 1.377               | 264.59               | 5.203                 | 298.67            | 0.00461            |
| TAXI-IDLE | 0.040               | 448.0         | 2.204                     | 1130.329              | 1.000              | 7.00                    | 0.257               | 131.87               | 1.950                 | 52.27             | 0.00492            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.005  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1170.19  
LBS POLLUTANT/1000K LB TH AT T.O.: 972.53

DATE: 8/4/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 311 ENGINE TYPE AND MODEL: CJ-805-3A SERIAL NUMFR: GE-161-108  
RATED THRUST: 11200.

ENGINE TOTAL TIME: 22738. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 TF FUEL W/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 29.04 FINISH 29.04

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0154

RELATIVE HUMIDITY: 66.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. THIS IS THE THIRD OF FOUR TESTS ON THIS ENGINE. THE C1-2 CONCENTRATION IN THE FUEL FOR THIS TEST WAS MINIMUM (0.0125% BY VOLUME).

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 8260.00                  | 73                 | 7150.00          | 7150.00 | 6780.00 | 149.20                   | 0.012600                | -0.00    | -0.00                               | -0.00                     |                              |
| 3.00         | 2/ 1      | 9800.00                  | 78                 | 7200.00          | 7200.00 | 7390.00 | 152.80                   | 0.013400                | -0.00    | -0.00                               | -0.00                     |                              |
| 60.00        | 3/ 2      | 10000.00                 | 89                 | 7410.00          | 7410.00 | 8620.00 | 162.60                   | 0.014700                | -0.00    | -0.00                               | -0.00                     |                              |
| 10.00        | 4/ 3      | 400.00                   | 3                  | 4510.00          | 4510.00 | 1080.00 | 43.40                    | 0.006900                | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 73                       | 999.00                     | 16.90                     | 56.00         | 2.56                 | 0.0            | 56.00         | 5.00            | 61.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 1040.00                    | 18.00                     | 54.00         | 2.75                 | 0.0            | 61.00         | 5.00            | 66.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1146.00                    | 20.90                     | 53.00         | 3.00                 | 0.0            | 75.00         | 6.00            | 91.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 725.00                     | 0.50                      | 471.00        | 1.43                 | 345.00         | 3.00          | 4.00            | 7.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 73                       | 4.35                      | 0.0                       | 0.64                       | 3126.40                    | 7.15                      | 7.79                       | 29.51             | 0.0               | 4.33               | 21197.00           | 48.47             | 52.80              |
| 78                       | 3.91                      | 0.0                       | 0.59                       | 3127.10                    | 7.25                      | 7.85                       | 28.88             | 0.0               | 4.39               | 23109.24           | 53.59             | 57.98              |
| 89                       | 3.52                      | 0.0                       | 0.65                       | 3127.71                    | 8.17                      | 9.92                       | 30.31             | 0.0               | 5.64               | 26960.90           | 70.46             | 85.49              |
| 3                        | 62.14                     | 26.07                     | 0.87                       | 2964.10                    | 0.65                      | 1.52                       | 67.11             | 28.15             | 0.94               | 3201.23            | 0.70              | 1.64               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 73                       | 3.573          | 2566.222         | 0.0             | 5.868          | 0.524            | 6.392            |
| 78                       | 3.282          | 2626.052         | 0.0             | 6.090          | 0.499            | 6.589            |
| 89                       | 3.031          | 2696.090         | 0.0             | 7.046          | 0.564            | 8.549            |
| 3                        | 167.766        | 8003.078         | 70.380          | 1.755          | 2.340            | 4.095            |

CAL ID NUMBER: 311 ENGINE TYPE AND MODEL: CJ-805-3A  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: GE-161-108

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 49.689                    | 779.294               | 1.000              | 19.00                   | 15.735             | 246.78               | 63.761                | 141.87            | 0.11091            |
| TAKEOFF   | 1.000               | 11200.0       | 33.853                    | 9948.277              | 1.000              | 0.70                    | 0.395              | 116.06               | 3.403                 | 130.67            | 0.00302            |
| CLIMBOUT  | 0.850               | 9520.0        | 32.388                    | 8195.566              | 1.000              | 2.20                    | 1.188              | 300.50               | 3.952                 | 349.07            | 0.00340            |
| APPROACH  | 0.400               | 4480.0        | 28.991                    | 3833.509              | 1.000              | 4.00                    | 1.933              | 255.57               | 7.563                 | 298.67            | 0.00647            |
| TAXI-IDLE | 0.040               | 448.0         | 49.689                    | 779.294               | 1.000              | 7.00                    | 5.797              | 90.92                | 63.761                | 52.27             | 0.11091            |

TOTAL FOR CYCLE: 25.047 1009.83 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 24.803  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 25.754  
LBS POLLUTANT/1000K LB TH AT T.O.: 3.526

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 21.254                    | 779.294               | 1.000              | 19.00                   | 6.730              | 246.78               | 27.273                | 141.87            | 0.04744            |
| TAKEOFF   | 1.000               | 11200.0       | 1.134                     | 9948.277              | 1.000              | 0.70                    | 0.013              | 116.06               | 0.114                 | 130.67            | 0.00010            |
| CLIMBOUT  | 0.850               | 9520.0        | 0.934                     | 8195.566              | 1.000              | 2.20                    | 0.034              | 300.50               | 0.114                 | 349.07            | 0.00010            |
| APPROACH  | 0.400               | 4480.0        | 2.698                     | 3833.509              | 1.000              | 4.00                    | 0.180              | 255.57               | 0.704                 | 298.67            | 0.00060            |
| TAXI-IDLE | 0.040               | 448.0         | 21.254                    | 779.294               | 1.000              | 7.00                    | 2.480              | 90.92                | 27.273                | 52.27             | 0.04744            |

TOTAL FOR CYCLE: 9.437 1009.83 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 9.346  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 9.704  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.181

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 0.866                     | 779.294               | 1.000              | 19.00                   | 0.274               | 246.78               | 1.111                 | 141.87            | 0.00193            |
| TAKEOFF   | 1.000               | 11200.0       | 104.178                   | 9948.277              | 1.000              | 0.70                    | 1.215               | 116.06               | 10.472                | 130.67            | 0.00930            |
| CLIMBOUT  | 0.850               | 9520.0        | 71.064                    | 8195.566              | 1.000              | 2.20                    | 2.606               | 300.50               | 8.671                 | 349.07            | 0.00746            |
| APPROACH  | 0.400               | 4480.0        | 17.438                    | 3833.509              | 1.000              | 4.00                    | 1.163               | 255.57               | 4.549                 | 298.67            | 0.00389            |
| TAXI-IDLE | 0.040               | 448.0         | 0.866                     | 779.294               | 1.000              | 7.00                    | 0.101               | 90.92                | 1.111                 | 52.27             | 0.00193            |

TOTAL FOR CYCLE: 5.359 1009.83 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.307  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.510  
LBS POLLUTANT/1000K LB TH AT T.O.: 108.519

DATE: 8/ 4/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 312 ENGINE TYPE AND MODFL: CJ-805-3A SERIAL NUMBER: GE-161-108

RATED THRUST: 11200.

ENGINE TOTAL TIME: 22738. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 29.04 FINISH 29.04

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0154

RELATIVE HUMIDITY: 66.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. THIS IS THE LAST OF FOUR TESTS ON THIS ENGINE. THE FUEL USED DURING THIS TEST CONTAINED THE NORMAL CONCENTRATION OF CI-2 (0.2% BY VOLUME).

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 8080.00                  | 72                 | 7140.00          | 7140.00 | 6650.00 | 147.80                   | 0.012500                | -0.00    | -0.00                               | -0.00                     |                              |
| 30.00        | 2/ 1      | 8820.00                  | 78                 | 7210.00          | 7210.00 | 7320.00 | 152.20                   | 0.013300                | -0.00    | -0.00                               | -0.00                     |                              |
| 5.00         | 3/ 2      | 10000.00                 | 89                 | 7400.00          | 7400.00 | 8590.00 | 162.00                   | 0.014700                | -0.00    | -0.00                               | -0.00                     |                              |
| 9.00         | 4/ 3      | 400.00                   | 3                  | 4510.00          | 4510.00 | 1090.00 | 44.50                    | 0.006800                | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 72                       | 981.00                     | 16.40                     | 65.00         | 2.53                 | 0.0            | 50.00         | 4.00            | 54.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 1042.00                    | 18.00                     | 64.00         | 2.70                 | 0.0            | 57.00         | 4.00            | 61.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1134.00                    | 20.80                     | 65.00         | 2.98                 | 0.0            | 71.00         | 4.00            | 75.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 728.00                     | 0.50                      | 492.00        | 1.38                 | 372.00         | 2.00          | 6.00            | 8.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 72                       | 5.11                      | 0.0                       | 0.52                       | 3125.21                    | 6.46                      | 6.97                       | 33.98             | 0.0               | 3.43               | 20782.66           | 42.94             | 46.37              |
| 78                       | 4.77                      | 0.0                       | 0.48                       | 3125.83                    | 6.90                      | 7.38                       | 34.52             | 0.0               | 3.54               | 22881.09           | 50.50             | 54.04              |
| 89                       | 4.34                      | 0.0                       | 0.44                       | 3126.42                    | 7.79                      | 8.23                       | 37.28             | 0.0               | 3.77               | 26855.95           | 66.89             | 70.66              |
| 3                        | 66.91                     | 28.97                     | 1.34                       | 2948.63                    | 0.45                      | 1.79                       | 72.93             | 31.58             | 1.46               | 3214.01            | 0.49              | 1.95               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 72                       | 4.206          | 2572.112         | 0.0             | 5.314          | 0.425            | 5.739            |
| 78                       | 3.914          | 2594.228         | 0.0             | 5.725          | 0.407            | 6.127            |
| 89                       | 3.728          | 2685.595         | 0.0             | 6.689          | 0.377            | 7.066            |
| 3                        | 192.120        | 3035.016         | 78.951          | 1.217          | 3.657            | 4.869            |

CAL ID NUMBER: 312 ENGINE TYPE AND MODEL: CJ-605-3A  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: GE-161-108

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 65.005                    | 965.026               | 1.000              | 19.00                   | 20.585             | 305.59               | 67.361                | 141.87            | 0.14510            |
| TAKEOFF   | 1.000               | 11200.0       | 36.430                    | 9838.379              | 1.000              | 0.70                    | 0.425              | 114.78               | 3.703                 | 130.67            | 0.00325            |
| CLIMBOUT  | 0.850               | 9520.0        | 36.374                    | 8220.949              | 1.000              | 2.20                    | 1.341              | 301.43               | 4.449                 | 349.07            | 0.00384            |
| APPROACH  | 0.400               | 4480.0        | 31.411                    | 3738.900              | 1.000              | 4.00                    | 2.094              | 249.26               | 8.401                 | 298.67            | 0.00701            |
| TAXI-IDLE | 0.040               | 448.0         | 65.005                    | 965.026               | 1.000              | 7.00                    | 7.584              | 112.59               | 67.361                | 52.27             | 0.14510            |

TOTAL FOR CYCLE: 32.029 1083.65 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 29.557  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 32.934  
LBS POLLUTANT/1000K LB TH AT T.O.: 3.795

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 30.098                    | 965.026               | 1.000              | 19.00                   | 9.531              | 305.59               | 31.189                | 141.87            | 0.06718            |
| TAKEOFF   | 1.000               | 11200.0       | 0.0                       | 9838.379              | 1.000              | 0.70                    | 0.0                | 114.78               | 0.0                   | 130.67            | 0.0                |
| CLIMBOUT  | 0.850               | 9520.0        | 0.0                       | 8220.949              | 1.000              | 2.20                    | 0.0                | 301.43               | 0.0                   | 349.07            | 0.0                |
| APPROACH  | 0.400               | 4480.0        | 1.863                     | 3738.900              | 1.000              | 4.00                    | 0.124              | 249.26               | 0.498                 | 298.67            | 0.00042            |
| TAXI-IDLE | 0.040               | 448.0         | 30.098                    | 965.026               | 1.000              | 7.00                    | 3.511              | 112.59               | 31.189                | 52.27             | 0.06718            |

TOTAL FOR CYCLE: 13.167 1083.65 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 12.150  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.539  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 448.0         | 1.257                     | 965.026               | 1.000              | 19.00                   | 0.398               | 305.59               | 1.303                 | 141.87            | 0.00281            |
| TAKEOFF   | 1.000               | 11200.0       | 93.440                    | 9838.379              | 1.000              | 0.70                    | 1.090               | 114.78               | 9.498                 | 130.67            | 0.00834            |
| CLIMBOUT  | 0.850               | 9520.0        | 66.583                    | 8220.949              | 1.000              | 2.20                    | 2.441               | 301.43               | 8.099                 | 349.07            | 0.00699            |
| APPROACH  | 0.400               | 4480.0        | 16.798                    | 3738.900              | 1.000              | 4.00                    | 1.120               | 249.26               | 4.493                 | 298.67            | 0.00375            |
| TAXI-IDLE | 0.040               | 448.0         | 1.257                     | 965.026               | 1.000              | 7.00                    | 0.147               | 112.59               | 1.303                 | 52.27             | 0.00281            |

TOTAL FOR CYCLE: 5.196 1083.65 972.53  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.795  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.343  
LBS POLLUTANT/1000K LB TH AT T.O.: 97.334

DATE: 7/21/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 319 ENGINE TYPE AND MODEL: CJ-805-3A SERIAL NUMBER: 161-255

RATED THRUST: 11200.

ENGINE TOTAL TIME: 21747. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 28.93 FINISH 28.94

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0119

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

A/F AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER              |               | ENGINE SPEED |         | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|---------------|--------------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
|              |           | THRUST, LBS OR SHP | PERCENT RATED | N1 RPM       | N2 RPM  |                          |                         |          |                                     |                           |                              |
| 0.0          | 1/ 0      | 8220.00            | 73            | 7115.00      | 7115.00 | 6550.00                  | 147.70                  | 0.012300 | -0.00                               | 2.16                      | -0.00                        |
| 5.55         | 2/ 1      | 8560.00            | 76            | 7165.00      | 7165.00 | 6910.00                  | 150.80                  | 0.012700 | -0.00                               | 2.24                      | -0.00                        |
| 12.00        | 3/ 2      | 9940.00            | 88            | 7330.00      | 7330.00 | 8350.00                  | 161.10                  | 0.014400 | -0.00                               | 2.46                      | -0.00                        |
| 15.45        | 4/ 3      | 400.00             | 3             | 4530.00      | 4530.00 | 1060.00                  | 36.40                   | 0.008100 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 76                       | 1002.00                    | 17.50                     | 44.00         | 2.59                 | 0.0            | 59.00         | 5.00            | 64.00           | -0.00     | -0.00 | -0.00        |
| 88                       | 1121.00                    | 20.80                     | 38.00         | 2.90                 | 0.0            | 77.00         | 6.00            | 83.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 729.00                     | 0.40                      | 552.00        | 1.56                 | 488.00         | 2.00          | 6.00            | 8.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
|                          |                           |                           |                            |                            |                           |                            |                   |                   |                    |                    |                   |                    |
| 76                       | 3.18                      | 0.0                       | 0.63                       | 3127.91                    | 7.45                      | 8.08                       | 23.37             | 0.0               | 4.36               | 21613.48           | 51.47             | 55.81              |
| 88                       | 2.61                      | 0.0                       | 0.68                       | 3129.14                    | 8.69                      | 9.36                       | 21.74             | 0.0               | 5.65               | 26128.32           | 72.52             | 78.19              |
| 3                        | 66.15                     | 33.49                     | 1.18                       | 2937.42                    | 0.39                      | 1.57                       | 70.12             | 35.50             | 1.25               | 3113.66            | 0.42              | 1.67               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                          |                |                  |                 |                |                  |                  |
| 76                       | 2.730          | 2524.998         | 0.0             | 6.013          | 0.510            | 6.523            |
| 88                       | 2.192          | 2624.604         | 0.0             | 7.296          | 0.569            | 7.865            |
| 3                        | 175.102        | 7784.148         | 88.759          | 1.043          | 3.130            | 4.173            |

CAL ID NUMBER: 319 ENGINE TYPE AND MODEL: CJ-805-3A  
TEST ORGANIZATION: S W R I TMA

SERIAL NUMBER: 161-255

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 74.980                    | 1106.440              | 1.000              | 19.00                   | 23.744             | 350.37               | 67.767                | 141.87            | 0.16737            |
| TAKEOFF                            | 1.000               | 11200.0       | 28.087                    | 10169.684             | 1.000              | 0.70                    | 0.328              | 118.65               | 2.762                 | 130.67            | 0.00251            |
| CLIMBOUT                           | 0.850               | 9520.0        | 22.659                    | 8346.832              | 1.000              | 2.20                    | 0.831              | 306.05               | 2.715                 | 349.07            | 0.00238            |
| APPROACH                           | 0.400               | 4480.0        | 69.828                    | 3239.294              | 1.000              | 4.00                    | 4.655              | 215.95               | 21.557                | 298.67            | 0.01559            |
| TAXI-IDLE                          | 0.040               | 448.0         | 74.980                    | 1106.440              | 1.000              | 7.00                    | 8.748              | 129.08               | 67.767                | 52.27             | 0.16737            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 38.305             | 1120.11              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 34.198             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 39.387             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.926              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 40.331                    | 1106.440              | 1.000              | 19.00                   | 12.772             | 350.37               | 36.451                | 141.87            | 0.09003            |
| TAKEOFF                            | 1.000               | 11200.0       | 1.433                     | 10169.684             | 1.000              | 0.70                    | 0.017              | 118.65               | 0.141                 | 130.67            | 0.00013            |
| CLIMBOUT                           | 0.850               | 9520.0        | 0.884                     | 8346.832              | 1.000              | 2.20                    | 0.032              | 306.05               | 0.106                 | 349.07            | 0.00009            |
| APPROACH                           | 0.400               | 4480.0        | 0.642                     | 3239.294              | 1.000              | 4.00                    | 0.043              | 215.95               | 0.198                 | 298.67            | 0.00014            |
| TAXI-IDLE                          | 0.040               | 448.0         | 40.331                    | 1106.440              | 1.000              | 7.00                    | 4.705              | 129.08               | 36.451                | 52.27             | 0.09003            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 17.569             | 1120.11              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.685             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 18.065             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.493              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 448.0         | 1.847                     | 1106.440              | 1.000              | 19.00                   | 0.585               | 350.37               | 1.669                 | 141.87            | 0.00412            |
| TAKEOFF                            | 1.000               | 11200.0       | 116.866                   | 10169.684             | 1.000              | 0.70                    | 1.363               | 118.65               | 11.492                | 130.67            | 0.01043            |
| CLIMBOUT                           | 0.850               | 9520.0        | 78.032                    | 8346.832              | 1.000              | 2.20                    | 2.861               | 306.05               | 9.349                 | 349.07            | 0.00820            |
| APPROACH                           | 0.400               | 4480.0        | 16.295                    | 3239.294              | 1.000              | 4.00                    | 1.086               | 215.95               | 5.031                 | 298.67            | 0.00364            |
| TAXI-IDLE                          | 0.040               | 448.0         | 1.847                     | 1106.440              | 1.000              | 7.00                    | 0.215               | 129.08               | 1.669                 | 52.27             | 0.00412            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.111               | 1120.11              |                       | 972.53            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.456               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.284               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 121.735             |                      |                       |                   |                    |

DATE: 7/26/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 321 ENGINE TYPE AND MODEL: JT3C-6 SERIAL NUMBER: 630895

RATED THRUST: 11000.

ENGINE TOTAL TIME: 22290. HRS

TIME SINCE HOT SECTION OVERHAUL: 5672. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 5672. HRS  
N2 COMPRESSOR OVERHAUL: 5672. HRS  
COMBUSTOR CAN REPLACEMENT: 5672. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 5672. HRS  
N1 TURBINE OVERHAUL: 5672. HRS  
N2 TURBINE OVERHAUL: 5672. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.01 FINISH 29.01

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0093

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

A/F AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 6800.00            | 61                       | 5730.00          | 5730.00                  | 144.00                  | 0.011100 | -0.00                               | 1.96                      | -0.00                        |
| 12.00        | 2/ 1      | 7920.00            | 71                       | 5920.00          | 6400.00                  | 152.10                  | 0.011700 | -0.00                               | 2.11                      | -0.00                        |
| 16.50        | 3/ 2      | 9740.00            | 88                       | 6330.00          | 8120.00                  | 167.00                  | 0.013700 | -0.00                               | 2.40                      | -0.00                        |
| 19.00        | 4/ 3      | 460.00             | 4                        | 7320.00          | 1110.00                  | 35.00                   | 0.008800 | -0.00                               | 1.10                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOX (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 61                       | 869.00                     | 13.40                     | 38.00         | 2.23                | 0.0            | 46.00         | 6.00           | 52.00          | -0.00     | -0.00 | -0.00        |
| 71                       | 925.00                     | 15.60                     | 28.00         | 2.34                | 0.0            | 55.00         | 3.00           | 58.00          | -0.00     | -0.00 | -0.00        |
| 88                       | 1081.00                    | 20.00                     | 11.00         | 2.76                | 0.0            | 73.00         | 0.0            | 73.00          | -0.00     | -0.00 | -0.00        |
| 4                        | 541.00                     | 0.70                      | 714.00        | 1.53                | 2160.00        | 2.00          | 6.00           | 8.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 61                       | 3.39                      | 0.0                       | 0.88                       | 3127.91                    | 6.75                      | 7.62                       | 19.44             | 0.0               | 5.04               | 17922.93           | 38.65             | 43.69              |
| 71                       | 2.38                      | 0.0                       | 0.47                       | 3129.50                    | 7.69                      | 8.11                       | 15.25             | 0.0               | 2.68               | 20028.77           | 49.21             | 51.90              |
| 88                       | 0.79                      | 0.0                       | 0.0                        | 3131.99                    | 8.66                      | 8.66                       | 6.45              | 0.0               | 0.0                | 25431.77           | 70.32             | 70.32              |
| 4                        | 78.34                     | 135.74                    | 1.08                       | 2637.76                    | 0.36                      | 1.44                       | 86.96             | 150.67            | 1.20               | 2927.91            | 0.40              | 1.60               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO2 LB/1K#TH-HR | NOX LB/1K#TH-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 61                       | 2.854          | 2635.725        | 0.0             | 5.684          | 0.741           | 6.425           |
| 71                       | 1.926          | 2528.885        | 0.0             | 6.214          | 0.339           | 6.553           |
| 88                       | 0.662          | 2611.065        | 0.0             | 7.220          | 0.0             | 7.220           |
| 4                        | 189.046        | 6365.020        | 327.544         | 0.870          | 2.609           | 3.479           |

CAL IO NUMBER: 321 ENGINE TYPE AND MODEL: JT3C-6  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: 630895

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 550.0         | 83.434                    | 1165.353              | 1.000              | 19.00                   | 26.421             | 369.03               | 71.595                | 174.17            | 0.15170            |
| TAKEOFF   | 1.000               | 11000.0       | 2.812                     | 9352.891              | 1.000              | 0.70                    | 0.033              | 109.12               | 0.301                 | 128.33            | 0.00026            |
| CLIMBOUT  | 0.850               | 9350.0        | 9.641                     | 7787.633              | 1.000              | 2.20                    | 0.354              | 285.55               | 1.238                 | 342.83            | 0.00103            |
| APPROACH  | 0.400               | 4400.0        | 32.132                    | 4054.447              | 1.000              | 4.00                    | 2.142              | 270.30               | 7.925                 | 293.33            | 0.00730            |
| TAXI-IDLE | 0.050               | 550.0         | 83.434                    | 1165.353              | 1.000              | 7.00                    | 9.734              | 135.96               | 71.595                | 64.17             | 0.15170            |

TOTAL FOR CYCLE: 38.683 1169.95 1002.83  
LBS POLLUTANT/1K LB FUEL/CYCLE: 33.064  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 38.574  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.298

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 550.0         | 167.968                   | 1165.353              | 1.000              | 19.00                   | 53.190             | 369.03               | 144.135               | 174.17            | 0.30540            |
| TAKEOFF   | 1.000               | 11000.0       | 2.647                     | 9352.891              | 1.000              | 0.70                    | 0.031              | 109.12               | 0.283                 | 128.33            | 0.00024            |
| CLIMBOUT  | 0.850               | 9350.0        | 1.337                     | 7787.633              | 1.000              | 2.20                    | 0.049              | 285.55               | 0.172                 | 342.83            | 0.00014            |
| APPROACH  | 0.400               | 4400.0        | 2.222                     | 4054.447              | 1.000              | 4.00                    | 0.148              | 270.30               | 0.548                 | 293.33            | 0.00050            |
| TAXI-IDLE | 0.050               | 550.0         | 167.968                   | 1165.353              | 1.000              | 7.00                    | 19.596             | 135.96               | 144.135               | 64.17             | 0.30540            |

TOTAL FOR CYCLE: 73.014 1169.95 1002.83  
LBS POLLUTANT/1K LB FUEL/CYCLE: 62.408  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 72.808  
LBS POLLUTANT/1000K LB TH AT T.O.: 2.807

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 550.0         | 1.751                     | 1165.353              | 1.000              | 19.00                   | 0.555               | 369.03               | 1.503                 | 174.17            | 0.00318            |
| TAKEOFF   | 1.000               | 11000.0       | 80.760                    | 9352.891              | 1.000              | 0.70                    | 0.942               | 109.12               | 8.635                 | 128.33            | 0.00734            |
| CLIMBOUT  | 0.850               | 9350.0        | 67.122                    | 7787.633              | 1.000              | 2.20                    | 2.461               | 285.55               | 8.619                 | 342.83            | 0.00718            |
| APPROACH  | 0.400               | 4400.0        | 23.970                    | 4054.447              | 1.000              | 4.00                    | 1.598               | 270.30               | 5.912                 | 293.33            | 0.00545            |
| TAXI-IDLE | 0.050               | 550.0         | 1.751                     | 1165.353              | 1.000              | 7.00                    | 0.204               | 135.96               | 1.503                 | 64.17             | 0.00318            |

TOTAL FOR CYCLE: 5.760 1169.95 1002.83  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.923  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.744  
LBS POLLUTANT/1000K LB TH AT T.O.: 85.654

DATE: 7/13/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 111 ENGINE TYPE AND MODFL: JT 3C - 7 SERIAL NUMBER: T6313298

RATED THRUST: 12000.

ENGINE TOTAL TIME: 24419. HRS

TIME SINCE HOT SECTION OVERHAUL: 9130. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9130. HRS  
 N2 COMPRESSOR OVERHAUL: 9130. HRS  
 COMBUSTOR CAN REPLACEMENT: 9130. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 9130. HRS  
 N1 TURBINE OVERHAUL: 9130. HRS  
 N2 TURBINE OVERHAUL: 9130. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 28.91 FINISH 28.91

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0191

RELATIVE HUMIDITY: 73.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 7

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FIRST, THIRD AND LAST  
 RUNS. NO2 DETERMINED BY SUBTRACTION

| ELAPSED<br>TIME | TFST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 1.00            | 4/ 0         | 360.00                            | 2                        | 2105.00                | 5780.00                           | 980.00                        | 36.30       | 0.007500                                     | -0.00                              | 1.10                                  |
| 4.45            | 5/ 4         | 8220.00                           | 68                       | 6010.00                | 9340.00                           | 6860.00                       | 152.90      | 0.012500                                     | -0.00                              | 2.20                                  |
| 6.30            | 4/ 5         | 440.00                            | 3                        | 2260.00                | 6020.00                           | 990.00                        | 37.20       | 0.007400                                     | -0.00                              | 1.10                                  |
| 15.00           | 1/ 4         | 6480.00                           | 53                       | 5710.00                | 9110.00                           | 5400.00                       | 140.10      | 0.010700                                     | -0.00                              | 1.93                                  |
| 18.00           | 2/ 1         | 7140.00                           | 59                       | 5830.00                | 9170.00                           | 6070.00                       | 145.80      | 0.011600                                     | -0.00                              | 2.04                                  |
| 22.30           | 3/ 2         | 9500.00                           | 79                       | 6300.00                | 9620.00                           | 8050.00                       | 163.30      | 0.013700                                     | -0.00                              | 2.40                                  |
| 27.00           | 4/ 3         | 560.00                            | 4                        | 2115.00                | 6420.00                           | 1210.00                       | 43.70       | 0.007700                                     | -0.00                              | 1.11                                  |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 2                                 | 580.00                              | 0.40                               | 785.00              | 1.26                          | 1730.00              | 2.00                | 5.00                     | 7.00                     | -0.00     | -0.00 | -0.00        |
| 68                                | 993.00                              | 16.40                              | 33.00               | 2.35                          | 16.00                | 51.00               | 4.00                     | 55.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | 555.00                              | 0.40                               | 694.00              | 1.26                          | 1550.00              | 1.00                | 6.00                     | 7.00                     | -0.00     | -0.00 | -0.00        |
| 53                                | 870.00                              | 12.60                              | 45.00               | 2.10                          | 17.00                | 33.00               | 9.00                     | 42.00                    | -0.00     | -0.00 | -0.00        |
| 59                                | 937.00                              | 14.10                              | 50.00               | 2.31                          | 11.00                | 43.00               | 6.00                     | 49.00                    | -0.00     | -0.00 | -0.00        |
| 79                                | 1085.00                             | 19.50                              | 28.00               | 2.66                          | 11.00                | 71.00               | 3.00                     | 74.00                    | -0.00     | -0.00 | -0.00        |
| 4                                 | 502.00                              | 0.60                               | 640.00              | 1.37                          | 1020.00              | 1.00                | 6.00                     | 7.00                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 2                                 | 103.97                             | 130.77                             | 1.08                                | 2611.90                             | 0.43                               | 1.52                                | 101.47                  | 128.10                  | 1.06                     | 2559.66                  | 0.47                    | 1.49                     |
| 68                                | 2.79                               | 0.78                               | 0.56                                | 3126.72                             | 7.09                               | 7.65                                | 19.17                   | 5.32                    | 3.82                     | 21449.31                 | 48.66                   | 52.48                    |
| 3                                 | 93.73                              | 119.76                             | 1.32                                | 2650.58                             | 0.22                               | 1.54                                | 92.30                   | 118.06                  | 1.31                     | 2637.99                  | 0.22                    | 1.53                     |
| 53                                | 4.26                               | 0.92                               | 1.40                                | 3124.02                             | 5.13                               | 6.53                                | 23.01                   | 4.98                    | 7.56                     | 16869.70                 | 27.71                   | 35.27                    |
| 59                                | 4.30                               | 0.54                               | 0.85                                | 3124.99                             | 6.08                               | 6.93                                | 26.13                   | 3.29                    | 5.15                     | 19968.68                 | 36.91                   | 42.06                    |
| 79                                | 2.10                               | 0.47                               | 0.37                                | 3128.65                             | 6.73                               | 9.10                                | 16.87                   | 3.80                    | 2.97                     | 25185.66                 | 70.28                   | 73.25                    |
| 4                                 | 83.09                              | 75.84                              | 1.28                                | 2794.63                             | 0.21                               | 1.49                                | 100.54                  | 91.77                   | 1.55                     | 3381.50                  | 0.26                    | 1.81                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 2                                 | 281.430           | 7110.168               | 355.846            | 1.180             | 2.950                  | 4.129                  |
| 68                                | 2.332             | 2679.406               | 0.648              | 5.920             | 0.464                  | 6.384                  |
| 3                                 | 299.772           | 5984.059               | 268.327            | 0.494             | 2.979                  | 3.475                  |
| 53                                | 3.550             | 2673.349               | 0.768              | 4.277             | 1.166                  | 5.443                  |
| 59                                | 3.560             | 2656.678               | 0.461              | 5.170             | 0.721                  | 5.891                  |
| 79                                | 1.776             | 2651.123               | 0.400              | 7.399             | 0.313                  | 7.710                  |
| 4                                 | 179.532           | 6039.383               | 163.873            | 0.461             | 2.765                  | 3.225                  |

CAL ID NUMBER: 111 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: T6313298  
TEST ORGANIZATION: S M R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 600.0         | 84.934                    | 1060.352              | 1.000              | 19.00                   | 26.896             | 335.78               | 80.100                | 190.00            | 0.14156            |
| TAKEOFF                            | 1.000               | 12000.0       | 17.805                    | 10598.488             | 1.000              | 0.70                    | 0.208              | 123.65               | 1.680                 | 140.00            | 0.00148            |
| CLIMBOUT                           | 0.850               | 10200.0       | 18.355                    | 8797.383              | 1.000              | 2.20                    | 0.673              | 322.57               | 2.086                 | 374.00            | 0.00180            |
| APPROACH                           | 0.400               | 4800.0        | 20.116                    | 4481.520              | 1.000              | 4.00                    | 1.341              | 298.77               | 4.489                 | 320.00            | 0.00419            |
| TAXI-IDLE                          | 0.050               | 600.0         | 84.934                    | 1060.352              | 1.000              | 7.00                    | 9.909              | 123.71               | 80.100                | 70.00             | 0.14156            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 39.027             | 1204.47              |                       | 1094.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 32.401             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 35.673             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.731              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 600.0         | 109.896                   | 1060.352              | 1.000              | 19.00                   | 34.800             | 335.78               | 103.641               | 190.00            | 0.18316            |
| TAKEOFF                            | 1.000               | 12000.0       | 2.975                     | 10598.488             | 1.000              | 0.70                    | 0.035              | 123.65               | 0.281                 | 140.00            | 0.00025            |
| CLIMBOUT                           | 0.850               | 10200.0       | 0.698                     | 8797.383              | 1.000              | 2.20                    | 0.026              | 322.57               | 0.079                 | 374.00            | 0.00007            |
| APPROACH                           | 0.400               | 4800.0        | 3.504                     | 4481.520              | 1.000              | 4.00                    | 0.234              | 298.77               | 0.782                 | 320.00            | 0.00073            |
| TAXI-IDLE                          | 0.050               | 600.0         | 109.896                   | 1060.352              | 1.000              | 7.00                    | 12.821             | 123.71               | 103.641               | 70.00             | 0.18316            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 47.915             | 1204.47              |                       | 1094.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 39.781             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 43.798             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.892              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 600.0         | 1.718                     | 1060.352              | 1.000              | 19.00                   | 0.544               | 335.78               | 1.620                 | 190.00            | 0.00286            |
| TAKEOFF                            | 1.000               | 12000.0       | 135.724                   | 10598.488             | 1.000              | 0.70                    | 1.583               | 123.65               | 12.806                | 140.00            | 0.01131            |
| CLIMBOUT                           | 0.850               | 10200.0       | 89.414                    | 8797.383              | 1.000              | 2.20                    | 3.279               | 322.57               | 10.164                | 374.00            | 0.00877            |
| APPROACH                           | 0.400               | 4800.0        | 23.307                    | 4481.520              | 1.000              | 4.00                    | 1.554               | 298.77               | 5.201                 | 320.00            | 0.00486            |
| TAXI-IDLE                          | 0.050               | 600.0         | 1.718                     | 1060.352              | 1.000              | 7.00                    | 0.200               | 123.71               | 1.620                 | 70.00             | 0.00286            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.160               | 1204.47              |                       | 1094.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.945               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.545               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 131.954             |                      |                       |                   |                    |

DATE: 7/15/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUM9FR: 113 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: 6313298

RATED THRUST: 12000.

ENGINE TOTAL TIME: 24419. HRS

TIME SINCE HOT SECTION OVERHAUL: 9130. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9130. HRS  
N2 COMPRESSOR OVERHAUL: 9130. HRS  
COMBUSTOR CAN REPLACEMENT: 9130. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 9130. HRS  
N1 TURBINE OVERHAUL: 9130. HRS  
N2 TURBINE OVERHAUL: 9130. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 28.89 FINISH 28.89

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0147

RELATIVE HUMIDITY: 53.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGRFFS C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SFC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 6520.00                  | 54                 | 5710.00          | 9090.00 | 5560.00 | 139.90                   | 0.011000                | -0.00    | 1.95                                | -0.00                     |                              |
| 7.00         | 2/ 1      | 7360.00                  | 61                 | 5860.00          | 9240.00 | 6160.00 | 146.50                   | 0.011700                | -0.00    | 2.06                                | -0.00                     |                              |
| 20.00        | 3/ 2      | 9560.00                  | 79                 | 6290.00          | 9610.00 | 8100.00 | 162.50                   | 0.013800                | -0.00    | 2.44                                | -0.00                     |                              |
| 25.00        | 4/ 3      | 360.00                   | 2                  | 2300.00          | 5870.00 | 1120.00 | 37.50                    | 0.008300                | -0.00    | 1.10                                | -0.00                     |                              |
| 30.00        | 5/ 4      | 8400.00                  | 69                 | 6050.00          | 9360.00 | 7070.00 | 153.50                   | 0.012800                | -0.00    | 2.25                                | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYDES | SNOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 54                       | 692.00                     | 12.80                     | 39.00         | 2.17                 | 24.00          | 43.00         | 0.0             | 43.00           | -0.00     | -0.00 | -0.00        |
| 61                       | 710.00                     | 14.60                     | 8.00          | 2.38                 | 19.00          | 47.00         | 1.00            | 48.00           | -0.00     | -0.00 | -0.00        |
| 79                       | 1077.00                    | 19.60                     | 5.00          | 2.67                 | 13.00          | 69.00         | 1.00            | 70.00           | -0.00     | -0.00 | -0.00        |
| 2                        | 537.00                     | 0.50                      | 768.00        | 1.40                 | 1930.00        | 3.00          | 3.00            | 6.00            | -0.00     | -0.00 | -0.00        |
| 69                       | 1095.00                    | 17.00                     | 23.00         | 2.49                 | 13.00          | 57.00         | 1.00            | 58.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 54                       | 3.57                      | 1.26                      | 0.0                        | 3124.17                    | 6.47                      | 6.47                       | 14.87             | 7.00              | 0.0                | 17370.39           | 35.98             | 35.98              |
| 61                       | 0.67                      | 0.91                      | 0.14                       | 3129.69                    | 6.46                      | 6.60                       | 4.12              | 5.61              | 0.85               | 19278.89           | 19.80             | 40.65              |
| 79                       | 0.37                      | 0.56                      | 0.12                       | 3131.13                    | 8.46                      | 8.58                       | 1.02              | 4.50              | 0.99               | 25362.15           | 68.52             | 69.51              |
| 2                        | 91.72                     | 132.01                    | 0.54                       | 2626.98                    | 0.59                      | 1.18                       | 102.72            | 147.85            | 0.66               | 2942.22            | 0.66              | 1.32               |
| 69                       | 1.84                      | 0.60                      | 0.13                       | 3128.72                    | 7.49                      | 7.62                       | 13.00             | 4.21              | 0.93               | 22120.04           | 52.94             | 53.86              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 54                       | 3.047          | 2664.170         | 1.074           | 5.519          | 0.0              | 5.519            |
| 61                       | 0.560          | 2619.415         | 0.762           | 5.408          | 0.115            | 5.523            |
| 79                       | 0.316          | 2652.945         | 0.471           | 7.167          | 0.104            | 7.271            |
| 2                        | 285.344        | 8172.840         | 410.686         | 1.831          | 1.831            | 3.662            |
| 69                       | 1.548          | 2633.338         | 0.501           | 6.302          | 0.111            | 6.412            |

CAL ID NUMBER: 113 ENGINE TYPE AND MODEL: JT 3C - 7  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: 6313298

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 18.307                    | 1247.862              | 1.000              | 19.00                   | 5.797              | 395.16               | 14.671                | 190.00            | 0.03051            |
| TAKEOFF   | 1.000               | 12000.0       | 0.0                       | 10455.684             | 1.000              | 0.70                    | 0.0                | 121.98               | 0.0                   | 140.00            | 0.0                |
| CLIMBOUT  | 0.850               | 10200.0       | 0.0                       | 8763.449              | 1.000              | 2.20                    | 0.0                | 321.33               | 0.0                   | 374.00            | 0.0                |
| APPROACH  | 0.400               | 4800.0        | 22.365                    | 4388.551              | 1.000              | 4.00                    | 1.491              | 292.57               | 5.096                 | 320.00            | 0.00466            |
| TAXI-IDLE | 0.050               | 600.0         | 18.307                    | 1247.862              | 1.000              | 7.00                    | 2.136              | 145.58               | 14.671                | 70.00             | 0.03051            |

TOTAL FOR CYCLE: 9.424 1276.62 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.382  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.614  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 12.502                    | 1247.862              | 1.000              | 19.00                   | 3.959              | 395.16               | 10.019                | 190.00            | 0.02084            |
| TAKEOFF   | 1.000               | 12000.0       | 0.0                       | 10455.684             | 1.000              | 0.70                    | 0.0                | 121.98               | 0.0                   | 140.00            | 0.0                |
| CLIMBOUT  | 0.850               | 10200.0       | 1.681                     | 8763.449              | 1.000              | 2.20                    | 0.062              | 321.33               | 0.192                 | 374.00            | 0.00016            |
| APPROACH  | 0.400               | 4800.0        | 6.920                     | 4388.551              | 1.000              | 4.00                    | 0.461              | 292.57               | 1.577                 | 320.00            | 0.00144            |
| TAXI-IDLE | 0.050               | 600.0         | 12.502                    | 1247.862              | 1.000              | 7.00                    | 1.459              | 145.58               | 10.019                | 70.00             | 0.02084            |

TOTAL FOR CYCLE: 5.941 1276.62 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.653  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.430  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 1.679                     | 1247.862              | 1.000              | 19.00                   | 0.532               | 395.16               | 1.345                 | 190.00            | 0.00280            |
| TAKEOFF   | 1.000               | 12000.0       | 104.248                   | 10455.684             | 1.000              | 0.70                    | 1.216               | 121.98               | 9.970                 | 140.00            | 0.00869            |
| CLIMBOUT  | 0.850               | 10200.0       | 78.200                    | 8763.449              | 1.000              | 2.20                    | 2.867               | 321.33               | 8.923                 | 374.00            | 0.00767            |
| APPROACH  | 0.400               | 4800.0        | 22.579                    | 4388.551              | 1.000              | 4.00                    | 1.505               | 292.57               | 5.145                 | 320.00            | 0.00470            |
| TAXI-IDLE | 0.050               | 600.0         | 1.679                     | 1247.862              | 1.000              | 7.00                    | 0.196               | 145.58               | 1.345                 | 70.00             | 0.00280            |

TOTAL FOR CYCLE: 6.316 1276.62 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.948  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.773  
LBS POLLUTANT/1000K LB TH AT T.O.: 101.352

DATE: 7/26/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 138 ENGINE TYPE AND MODFL: JT 3C - 7 SERIAL NUMBER: 632275

RATED THRUST: 12000.

ENGINE TOTAL TIME: 19558. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 12975. HRS  
N2 COMPRESSOR OVERHAUL: 974. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 3366. HRS  
N2 TURBINE OVERHAUL: 3867. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 66.20 FINISH 62.60

ATMOSPHERIC PRESSURE: START 29.92 FINISH 29.98

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

REPAIRED ENGINE, NOT CARBO-BLASTED  
EXHAUST GAS TEMPERATURE IN DEGREES C  
EXHAUST GAS PRESSURE IN INCHES HG.  
JT3C-7 PROBE USED

| CLOCK<br>TIME | TEST<br>MODE | POWER                    |                          | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |         | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|--------------------------|--------------------------|--------------------------|------------------------|---------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              | THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. |                          | N1                     | N2      |                                   |                               |             |                                              |                                    |                                       |
| 1631.00       | 1/ 0         | 7677.00                  | 63                       | 5835.00                  | 9223.00                | 6295.00 | -0.00                             | -0.000000                     | -0.00       | 2.13                                         | -0.00                              |                                       |
| 1637.00       | 2/ 1         | 9113.00                  | 75                       | 6088.00                  | 9439.00                | 7530.00 | -0.00                             | -0.000000                     | -0.00       | 2.37                                         | -0.00                              |                                       |
| 1642.00       | 3/ 2         | 10418.00                 | 88                       | 6387.00                  | 9698.00                | 8951.00 | -0.00                             | -0.000000                     | -0.00       | 2.62                                         | -0.00                              |                                       |
| 1721.00       | 4/ 3         | 442.00                   | 3                        | 2294.00                  | 6068.00                | 1701.00 | -0.00                             | -0.000000                     | -0.00       | -0.00                                        | -0.00                              |                                       |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 75                                | 513.00                              | 68.90                              | 50.00               | 2.65                          | 2.40                 | 74.00               | -0.00                    | 78.00                    | -0.00     | -0.00 |              |
| 88                                | 569.00                              | 75.80                              | 45.00               | 3.00                          | 2.40                 | 92.40               | -0.00                    | 98.40                    | -0.00     | -0.00 |              |
| 3                                 | 273.00                              | 31.60                              | 810.00              | 1.25                          | 1560.00              | 9.40                | -0.00                    | 9.80                     | -0.00     | -0.00 |              |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 75                                | 3.78                               | 0.10                               | -0.00                               | 3149.66                             | 9.19                               | 9.69                                | 28.48                   | 0.78                    | -0.00                    | 23716.96                 | 69.24                   | 72.94                    |
| 88                                | 3.01                               | 0.09                               | -0.00                               | 3150.91                             | 10.15                              | 10.80                               | 26.93                   | 0.82                    | -0.00                    | 28203.80                 | 90.81                   | 96.71                    |
| 3                                 | 109.41                             | 120.68                             | -0.00                               | 2652.90                             | 2.09                               | 2.17                                | 131.40                  | 144.94                  | -0.00                    | 3186.13                  | 2.50                    | 2.61                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 75                                | 3.125             | 2602.541               | 0.086              | 7.597             | -0.000                 | 8.008                  |
| 88                                | 2.536             | 2656.225               | 0.077              | 8.553             | -0.000                 | 9.108                  |
| 3                                 | 297.289           | 7208.449               | 327.917            | 5.667             | -0.000                 | 5.908                  |

CAL ID NUMBER: 138 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: 632275  
 TEST ORGANIZATION: UNITED/EPA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 125.910                   | 1317.390              | 1.000              | 19.00                   | 39.872             | 417.17               | 95.575                | 190.00            | 0.20985            |
| TAKEOFF   | 1.000               | 12000.0       | 19.916                    | 10326.199             | 1.000              | 0.70                    | 0.232              | 120.47               | 1.929                 | 140.00            | 0.00166            |
| CLIMBOUT  | 0.850               | 10200.0       | 23.257                    | 8612.996              | 1.000              | 2.20                    | 0.853              | 315.81               | 2.700                 | 374.00            | 0.00228            |
| APPROACH  | 0.400               | 4800.0        | 55.184                    | 4190.543              | 1.000              | 4.00                    | 3.679              | 279.37               | 13.169                | 320.00            | 0.01150            |
| TAXI-IDLE | 0.050               | 600.0         | 125.910                   | 1317.390              | 1.000              | 7.00                    | 14.690             | 153.70               | 95.575                | 70.00             | 0.20985            |

TOTAL FOR CYCLE: 59.325 1286.52 1094.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 46.113  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 54.228  
 LBS POLLUTANT/1000K LB TH AT T.O.: 1.936

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 124.746                   | 1317.390              | 1.000              | 19.00                   | 39.503             | 417.17               | 94.692                | 190.00            | 0.20791            |
| TAKEOFF   | 1.000               | 12000.0       | 0.0                       | 10326.199             | 1.000              | 0.70                    | 0.0                | 120.47               | 0.0                   | 140.00            | 0.0                |
| CLIMBOUT  | 0.850               | 10200.0       | 1.414                     | 8612.996              | 1.000              | 2.20                    | 0.052              | 315.81               | 0.164                 | 374.00            | 0.00014            |
| APPROACH  | 0.400               | 4800.0        | 20.937                    | 4190.543              | 1.000              | 4.00                    | 1.396              | 279.37               | 4.996                 | 320.00            | 0.00436            |
| TAXI-IDLE | 0.050               | 600.0         | 124.746                   | 1317.390              | 1.000              | 7.00                    | 14.554             | 153.70               | 94.692                | 70.00             | 0.20791            |

TOTAL FOR CYCLE: 55.504 1286.52 1094.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 43.143  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 50.735  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 2.990                     | 1317.390              | 1.000              | 19.00                   | 0.947               | 417.17               | 2.270                 | 190.00            | 0.00498            |
| TAKEOFF   | 1.000               | 12000.0       | 125.078                   | 10326.199             | 1.000              | 0.70                    | 1.459               | 120.47               | 12.113                | 140.00            | 0.01042            |
| CLIMBOUT  | 0.850               | 10200.0       | 90.517                    | 8612.996              | 1.000              | 2.20                    | 3.319               | 315.81               | 10.509                | 374.00            | 0.00887            |
| APPROACH  | 0.400               | 4800.0        | 24.481                    | 4190.543              | 1.000              | 4.00                    | 1.632               | 279.37               | 5.842                 | 320.00            | 0.00510            |
| TAXI-IDLE | 0.050               | 600.0         | 2.990                     | 1317.390              | 1.000              | 7.00                    | 0.349               | 153.70               | 2.270                 | 70.00             | 0.00498            |

TOTAL FOR CYCLE: 7.706 1286.52 1094.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 5.990  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.044  
 LBS POLLUTANT/1000K LB TH AT T.O.: 121.603

DATE: 7/21/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 405 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: 633559

RATED THRUST: 12000.

ENGINE TOTAL TIME: 16968. HRS

TIME SINCE HOT SECTION OVERHAUL: 16968. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11043. HRS  
N2 COMPRESSOR OVERHAUL: 17125. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 55.40 FINISH 57.02

ATMOSPHERIC PRESSURE: START 29.87 FINISH 29.96

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0091

RELATIVE HUMIDITY: 94.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
REGULAS PRODUCTION ENGINE

| CLUCK TIME | TEST MODF | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED PPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 622.00     | 1/ 0      | 7784.00                  | 64                 | 5818.00 9259.00        | 6307.00                  | -0.00                   | -0.000000 | -0.00                               | 2.15                      | -0.00                        |
| 627.00     | 2/ 1      | 9120.00                  | 75                 | 6059.00 9468.00        | 7440.00                  | -0.00                   | -0.000000 | -0.00                               | 2.37                      | -0.00                        |
| 639.00     | 3/ 2      | 10743.00                 | 89                 | 6384.00 9753.00        | 9020.00                  | -0.00                   | -0.000000 | -0.00                               | 2.64                      | -0.00                        |
| 739.00     | 4/ 3      | 436.00                   | 3                  | 2269.00 6050.00        | 1135.00                  | -0.00                   | -0.000000 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CC ? (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOPHYOES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 64                       | 867.20                     | 62.60                     | 60.00         | 2.25                 | 1.95           | 54.00         | -0.00           | 64.00           | -0.00     | -0.00 | -0.00        |
| 75                       | 948.20                     | 68.70                     | 40.00         | 2.45                 | 1.26           | 70.00         | -0.00           | 79.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1067.00                    | 76.10                     | 30.00         | 2.75                 | 1.30           | 102.00        | -0.00           | 110.00          | -0.00     | -0.00 | -0.00        |
| 3                        | 492.90                     | 31.60                     | 800.00        | 1.20                 | 1200.00        | 7.00          | -0.00           | 9.60            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 64                       | 5.34                      | 0.10                      | -0.00                      | 3147.22                    | 7.90                      | 9.36                       | 13.69             | 0.63              | -0.00              | 19849.54           | 49.80             | 59.02              |
| 75                       | 3.27                      | 0.06                      | -0.00                      | 3150.58                    | 9.41                      | 10.67                      | 24.36             | 0.44              | -0.00              | 23440.33           | 70.01             | 79.01              |
| 89                       | 2.19                      | 0.05                      | -0.00                      | 3152.30                    | 12.22                     | 13.18                      | 19.74             | 0.49              | -0.00              | 28433.76           | 110.25            | 118.90             |
| 3                        | 114.77                    | 98.60                     | -0.00                      | 2705.05                    | 1.65                      | 2.26                       | 130.27            | 111.91            | -0.00              | 3070.23            | 1.87              | 2.57               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 64                       | 4.328          | 2550.043         | 0.081           | 6.398          | -0.000           | 7.583            |
| 75                       | 2.671          | 2570.212         | 0.048           | 7.677          | -0.000           | 8.664            |
| 89                       | 1.838          | 2646.774         | 0.046           | 10.263         | -0.000           | 11.068           |
| 3                        | 246.782        | 7041.809         | 256.679         | 4.294          | -0.000           | 5.889            |

CAL ID NUMBER: 405 ENGINE TYPE AND MODEL: JT 3C - 7  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 633559

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 118.586                   | 1174.937              | 1.000              | 19.00                   | 37.552             | 372.06               | 100.930               | 190.00            | 0.19764            |
| TAKEOFF   | 1.000               | 12000.0       | 5.362                     | 10374.938             | 1.000              | 0.70                    | 0.063              | 121.04               | 0.517                 | 140.00            | 0.00045            |
| CLIMBOUT  | 0.850               | 10200.0       | 19.603                    | 8646.199              | 1.000              | 2.20                    | 0.719              | 317.03               | 2.267                 | 374.00            | 0.00192            |
| APPROACH  | 0.400               | 4800.0        | 76.490                    | 3920.626              | 1.000              | 4.00                    | 5.099              | 261.38               | 19.510                | 320.00            | 0.01594            |
| TAXI-IDLE | 0.050               | 600.0         | 118.586                   | 1174.937              | 1.000              | 7.00                    | 13.835             | 137.08               | 100.930               | 70.00             | 0.19764            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 57.268  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 47.384  
LBS POLLUTANT/1000K LB TH AT T.O.: 52.347  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.521

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 96.838                    | 1174.937              | 1.000              | 19.00                   | 30.665             | 372.06               | 82.420                | 190.00            | 0.16140            |
| TAKEOFF   | 1.000               | 12000.0       | 0.0                       | 10374.938             | 1.000              | 0.70                    | 0.0                | 121.04               | 0.0                   | 140.00            | 0.0                |
| CLIMBOUT  | 0.850               | 10200.0       | 0.0                       | 8646.199              | 1.000              | 2.20                    | 0.0                | 317.03               | 0.0                   | 374.00            | 0.0                |
| APPROACH  | 0.400               | 4800.0        | 8.134                     | 3920.626              | 1.000              | 4.00                    | 0.542              | 261.38               | 2.075                 | 320.00            | 0.00169            |
| TAXI-IDLE | 0.050               | 600.0         | 96.838                    | 1174.937              | 1.000              | 7.00                    | 11.298             | 137.08               | 82.420                | 70.00             | 0.16140            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 42.505  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 35.170  
LBS POLLUTANT/1000K LB TH AT T.O.: 38.853  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 2.806                     | 1174.937              | 1.000              | 19.00                   | 0.889               | 372.06               | 2.388                 | 190.00            | 0.00468            |
| TAKEOFF   | 1.000               | 12000.0       | 160.598                   | 10374.938             | 1.000              | 0.70                    | 1.874               | 121.04               | 15.479                | 140.00            | 0.01338            |
| CLIMBOUT  | 0.850               | 10200.0       | 106.754                   | 8646.199              | 1.000              | 2.20                    | 3.914               | 317.03               | 12.347                | 374.00            | 0.01047            |
| APPROACH  | 0.400               | 4800.0        | 26.170                    | 3920.626              | 1.000              | 4.00                    | 1.745               | 261.38               | 6.675                 | 320.00            | 0.00545            |
| TAXI-IDLE | 0.050               | 600.0         | 2.806                     | 1174.937              | 1.000              | 7.00                    | 0.327               | 137.08               | 2.388                 | 70.00             | 0.00468            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 8.749  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.239  
LBS POLLUTANT/1000K LB TH AT T.O.: 7.997  
LBS POLLUTANT/1000K LB TH AT T.O.: 156.136

DATE: 7/22/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 407 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: 633042

RATED THRUST: 12000.

ENGINE TOTAL TIME: 13754. HRS

TIME SINCE MDT SECTION OVERHAUL: 13754. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 57.20 FINISH 57.20

ATMOSPHERIC PRESSURE: START 29.96 FINISH 29.98

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0096

RELATIVE HUMIDITY: 94.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
ENGINE CAPRO-BLASTED PRIOR TO EMISSIONS RUN.  
HIGH OIL CONSUMPTION.

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 449.00     | 1/ 0      | 7409.00                  | 65                 | 5838.00          | 9228.00 | 6251.00 | -0.00                    | -0.000000               | -0.00    | 2.14                                | -0.00                     |                              |
| 454.00     | 2/ 1      | 9113.00                  | 75                 | 6061.00          | 9419.00 | 7326.00 | -0.00                    | -0.000000               | -0.00    | 2.36                                | -0.00                     |                              |
| 457.00     | 3/ 2      | 10861.00                 | 90                 | 6403.00          | 9708.00 | 8974.00 | -0.00                    | -0.000000               | -0.00    | 2.65                                | -0.00                     |                              |
| 513.00     | 4/ 3      | 399.00                   | 3                  | 2251.00          | 5966.00 | 1182.00 | -0.00                    | -0.000000               | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | 872.60                     | 62.50                     | 60.00         | 2.15                 | 3.60           | 36.00         | -0.00           | 38.00           | -0.00     | -0.00 | -0.00        |
| 75                       | 957.20                     | 68.60                     | 45.00         | 2.40                 | 3.06           | 50.00         | -0.00           | 52.00           | -0.00     | -0.00 | -0.00        |
| 90                       | 1070.60                    | 76.50                     | 40.00         | 2.65                 | 3.00           | 68.00         | -0.00           | 72.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 527.00                     | 31.50                     | 590.00        | 0.90                 | 219.00         | 8.40          | -0.00           | 8.40            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CU LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 65                       | 5.59                      | 0.19                      | -0.00                      | 3146.58                    | 5.51                      | 5.81                       | 34.94             | 1.20              | -0.00              | 19669.28           | 34.43             | 36.34              |
| 75                       | 3.76                      | 0.15                      | -0.00                      | 3149.58                    | 6.86                      | 7.13                       | 27.53             | 1.07              | -0.00              | 23073.84           | 50.25             | 52.26              |
| 90                       | 3.03                      | 0.13                      | -0.00                      | 3150.78                    | 8.45                      | 8.95                       | 27.16             | 1.17              | -0.00              | 28275.07           | 75.85             | 80.31              |
| 3                        | 120.41                    | 25.68                     | -0.00                      | 2895.61                    | 2.93                      | 2.83                       | 142.80            | 30.36             | -0.00              | 3422.60            | 3.34              | 3.34               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 65                       | 4.474          | 2518.796         | 0.154           | 4.405          | -0.000           | 4.654            |
| 75                       | 3.071          | 2531.970         | 0.118           | 5.514          | -0.000           | 5.735            |
| 90                       | 2.501          | 2603.358         | 0.107           | 6.984          | -0.000           | 7.194            |
| 3                        | 357.894        | 8577.953         | 76.084          | 8.370          | -0.000           | 8.370            |

CAL ID NUMBER: 407 ENGINE TYPE AND MODEL: JT 3C - 7  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 633042

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 129.513                   | 1280.095              | 1.000              | 19.00                   | 41.013             | 405.36               | 101.175               | 190.00            | 0.21586            |
| TAKEOFF   | 1.000               | 12000.0       | 13.406                    | 10009.320             | 1.000              | 0.70                    | 0.156              | 116.78               | 1.339                 | 140.00            | 0.00112            |
| CLIMBOUT  | 0.850               | 10200.0       | 23.547                    | 8430.910              | 1.000              | 2.20                    | 0.863              | 309.13               | 2.793                 | 374.00            | 0.00231            |
| APPROACH  | 0.400               | 4800.0        | 71.655                    | 3888.995              | 1.000              | 4.00                    | 4.777              | 259.27               | 18.425                | 320.00            | 0.01493            |
| TAXI-IDLE | 0.050               | 600.0         | 129.513                   | 1280.095              | 1.000              | 7.00                    | 15.110             | 149.34               | 101.175               | 70.00             | 0.21586            |

TOTAL FOR CYCLE: 61.919 1239.88 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 49.940  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 56.599  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.303

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 25.973                    | 1280.095              | 1.000              | 19.00                   | 8.225              | 405.36               | 20.290                | 190.00            | 0.04329            |
| TAKEOFF   | 1.000               | 12000.0       | 0.361                     | 10009.320             | 1.000              | 0.70                    | 0.004              | 116.78               | 0.036                 | 140.00            | 0.00003            |
| CLIMBOUT  | 0.850               | 10200.0       | 0.601                     | 8430.910              | 1.000              | 2.20                    | 0.022              | 309.13               | 0.071                 | 374.00            | 0.00006            |
| APPROACH  | 0.400               | 4800.0        | 3.230                     | 3888.995              | 1.000              | 4.00                    | 0.215              | 259.27               | 0.831                 | 320.00            | 0.00067            |
| TAXI-IDLE | 0.050               | 600.0         | 25.973                    | 1280.095              | 1.000              | 7.00                    | 3.030              | 149.34               | 20.290                | 70.00             | 0.04329            |

TOTAL FOR CYCLE: 11.497 1239.88 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 9.272  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 10.509  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.351

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 3.710                     | 1280.095              | 1.000              | 19.00                   | 1.175               | 405.36               | 2.899                 | 190.00            | 0.00618            |
| TAKEOFF   | 1.000               | 12000.0       | 103.358                   | 10009.320             | 1.000              | 0.70                    | 1.206               | 116.78               | 10.326                | 140.00            | 0.00861            |
| CLIMBOUT  | 0.850               | 10200.0       | 70.736                    | 8430.910              | 1.000              | 2.20                    | 2.594               | 309.13               | 8.390                 | 374.00            | 0.00693            |
| APPROACH  | 0.400               | 4800.0        | 17.638                    | 3888.995              | 1.000              | 4.00                    | 1.176               | 259.27               | 4.535                 | 320.00            | 0.00367            |
| TAXI-IDLE | 0.050               | 600.0         | 3.710                     | 1280.095              | 1.000              | 7.00                    | 0.433               | 149.34               | 2.899                 | 70.00             | 0.00618            |

TOTAL FOR CYCLE: 6.583 1239.88 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.310  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.018  
LBS POLLUTANT/1000K LB TH AT T.O.: 100.487

DATE: 7/22/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMRFR: 408 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: 632283

RATED THRUST: 12000.

ENGINE TOTAL TIME: 12765. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 13808. HRS

N2 COMPRESSOR OVERHAUL: 15286. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 73.40 FINISH 68.00

ATMOSPHERIC PRESSURE: START 29.98 FINISH 29.98

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0

RELATIVE HUMIDITY: 0.0 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
CARBID-ALAST(WALNUTS) PRIOR TO EMISSIONS RUN.  
PROBE SHIFTED 20 DEGREES FROM VERTICAL

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO RPM | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1404.00    | 1/ 0      | 7802.00            | 65                       | 5874.00          | 9281.00                  | 6289.00                 | -0.00    | -0.000000                           | -0.00                     | 2.13                         |
| 1407.00    | 2/ 1      | 9213.00            | 76                       | 6118.00          | 9488.00                  | 7441.00                 | -0.00    | -0.000000                           | -0.00                     | 2.37                         |
| 1418.00    | 3/ 2      | 10743.00           | 89                       | 6429.00          | 9783.00                  | 8950.00                 | -0.00    | -0.000000                           | -0.00                     | 2.62                         |
| 1457.00    | 4/ 3      | 411.00             | 3                        | 2238.00          | 6027.00                  | 1068.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | 870.80                     | 62.40                     | 60.00         | 2.30                 | 1.38           | 54.00         | -0.00           | 58.00           | -0.00     | -0.00 | -0.00        |
| 76                       | 948.20                     | 68.90                     | 40.00         | 2.50                 | 1.70           | 68.00         | -0.00           | 73.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1058.00                    | 75.80                     | 30.00         | 2.80                 | 1.50           | 94.00         | -0.00           | 10.00           | -0.00     | -0.00 | -0.00        |
| 3                        | 512.60                     | 11.60                     | 610.00        | 1.20                 | 1470.00        | 10.00         | -0.00           | 10.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 65                       | 5.23                      | 0.07                      | -0.00                      | 3147.49                    | 7.73                      | 8.30                       | 32.86             | 0.43              | -0.00              | 19794.57           | 48.58             | 52.18              |
| 76                       | 3.71                      | 0.06                      | -0.00                      | 3150.70                    | 8.96                      | 9.62                       | 23.87             | 0.41              | -0.00              | 23444.34           | 66.66             | 71.57              |
| 89                       | 2.15                      | 0.06                      | -0.00                      | 3152.34                    | 11.06                     | 1.18                       | 19.24             | 0.55              | -0.00              | 28213.46           | 99.02             | 10.51              |
| 3                        | 87.02                     | 120.10                    | -0.00                      | 2689.68                    | 2.34                      | 2.34                       | 92.94             | 128.27            | -0.00              | 2872.58            | 2.50              | 2.50               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 65                       | 4.212          | 2537.115         | 0.055           | 6.227          | -0.000           | 6.688            |
| 76                       | 2.591          | 2544.702         | 0.045           | 7.236          | -0.000           | 7.768            |
| 89                       | 1.791          | 2626.218         | 0.051           | 9.217          | -0.000           | 0.981            |
| 3                        | 226.121        | 5989.238         | 312.085         | 6.089          | -0.000           | 6.089            |

CAL ID NUMBER: 408 ENGINE TYPE AND MODEL: JT 3C - 7  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 632283

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 87.698                    | 1138.526              | 1.000              | 19.00                   | 27.771             | 360.53               | 77.028                | 190.00            | 0.14616            |
| TAKEOFF   | 1.000               | 12000.0       | 3.953                     | 10165.035             | 1.000              | 0.70                    | 0.046              | 118.59               | 0.389                 | 140.00            | 0.00033            |
| CLIMBOUT  | 0.850               | 10200.0       | 17.296                    | 8525.746              | 1.000              | 2.20                    | 0.634              | 312.61               | 2.029                 | 374.00            | 0.00170            |
| APPROACH  | 0.400               | 4800.0        | 65.166                    | 3883.257              | 1.000              | 4.00                    | 4.344              | 258.88               | 16.781                | 320.00            | 0.01358            |
| TAXI-IDLE | 0.050               | 600.0         | 87.698                    | 1138.526              | 1.000              | 7.00                    | 10.231             | 132.83               | 77.028                | 70.00             | 0.14616            |

TOTAL FOR CYCLE: 43.027 1183.45 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 36.358  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 39.330  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.384

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 107.406                   | 1138.526              | 1.000              | 19.00                   | 34.012             | 360.53               | 94.337                | 190.00            | 0.17901            |
| TAKEOFF   | 1.000               | 12000.0       | 0.0                       | 10165.035             | 1.000              | 0.70                    | 0.0                | 118.59               | 0.0                   | 140.00            | 0.0                |
| CLIMBOUT  | 0.850               | 10200.0       | 0.521                     | 8525.746              | 1.000              | 2.20                    | 0.019              | 312.61               | 0.061                 | 374.00            | 0.00005            |
| APPROACH  | 0.400               | 4800.0        | 12.884                    | 3883.257              | 1.000              | 4.00                    | 0.859              | 258.88               | 3.318                 | 320.00            | 0.00268            |
| TAXI-IDLE | 0.050               | 600.0         | 107.406                   | 1138.526              | 1.000              | 7.00                    | 12.531             | 132.83               | 94.337                | 70.00             | 0.17901            |

TOTAL FOR CYCLE: 47.420 1183.45 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 40.070  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 43.346  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 600.0         | 2.765                     | 1138.526              | 1.000              | 19.00                   | 0.876               | 360.53               | 2.429                 | 190.00            | 0.00461            |
| TAKEOFF   | 1.000               | 12000.0       | 123.292                   | 10165.035             | 1.000              | 0.70                    | 1.438               | 118.59               | 12.129                | 140.00            | 0.01027            |
| CLIMBOUT  | 0.850               | 10200.0       | 89.981                    | 8525.746              | 1.000              | 2.20                    | 3.299               | 312.61               | 10.554                | 374.00            | 0.00882            |
| APPROACH  | 0.400               | 4800.0        | 24.338                    | 3883.257              | 1.000              | 4.00                    | 1.623               | 258.88               | 6.267                 | 320.00            | 0.00507            |
| TAXI-IDLE | 0.050               | 600.0         | 2.765                     | 1138.526              | 1.000              | 7.00                    | 0.323               | 132.83               | 2.429                 | 70.00             | 0.00461            |

TOTAL FOR CYCLE: 7.559 1183.45 1094.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.387  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.909  
LBS POLLUTANT/1000K LB TH AT T.O.: 119.867

DATE: 6/29/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 62 ENGINE TYPE AND MODEL: JT3D

SERIAL NUMBER: X-315-44

RATED THRUST: 21000.

ENGINE TOTAL TIME: -0. MRS

TIME SINCE HOT SECTION OVERHAUL: -0. MRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. MRS

N2 COMPRESSOR OVERHAUL: -0. MRS

COMBUSTOR CAN REPLACEMENT: -0. MRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. MRS

N1 TURBINE OVERHAUL: -0. MRS

N2 TURBINE OVERHAUL: -0. MRS

FUEL: JP-4C

FUEL H/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 68.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.10

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0101

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00; FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 11

COMMENTS:

BURNER = B/M

| CLOCK TIME | TEST MODE | POWER<br>THRUST, LBS<br>OP<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 | ENGINE<br>SPEED<br>RPM<br>N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|-----------------------------------|--------------------------|------------------------------|------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 1102.00    | 1/ 0      | 756.00                            | 3                        | 1925.00                      | 5450.00                      | 1077.00                           | 36.08                         | 0.008360    | 195.00                                       | 1.02                               | 763.00                                |
| 1130.00    | 2/ 1      | 1777.00                           | 8                        | 2610.00                      | 6861.00                      | 1523.00                           | 51.70                         | 0.008330    | 283.00                                       | 1.05                               | 861.00                                |
| 1139.00    | 3/ 2      | 6778.00                           | 32                       | 4430.00                      | 8545.00                      | 3577.00                           | 102.70                        | 0.009770    | 485.00                                       | 1.20                               | 1162.00                               |
| 1148.00    | 4/ 3      | 14428.00                          | 69                       | 5880.00                      | 9575.00                      | 7789.00                           | 161.91                        | 0.013540    | 660.00                                       | 1.58                               | 1548.00                               |
| 1203.00    | 5/ 4      | 19855.00                          | 94                       | 6590.00                      | 10095.00                     | 11255.00                          | 193.51                        | 0.016420    | 754.00                                       | 1.91                               | 1801.00                               |
| 1220.00    | 6/ 5      | 20712.00                          | 98                       | 6730.00                      | 10210.00                     | 11905.00                          | 19865.00                      | 0.016920    | 779.00                                       | 1.98                               | 1852.00                               |
| 1517.00    | 7/ 6      | 18811.00                          | 89                       | 6450.00                      | 10008.00                     | 10421.00                          | 185.54                        | 0.015850    | 747.00                                       | 1.83                               | 1761.00                               |
| 1542.00    | 8/ 7      | 10325.00                          | 49                       | 5755.00                      | 9150.00                      | 5413.00                           | 132.89                        | 0.011440    | 589.00                                       | 1.37                               | 1363.00                               |
| 1553.00    | 4/ 8      | 2290.00                           | 10                       | 2855.00                      | 7235.00                      | 1692.00                           | 59.20                         | 0.008000    | 318.00                                       | 1.06                               | 877.00                                |
| 1602.00    | 10/ 9     | 1349.00                           | 6                        | 2235.00                      | 6260.00                      | 1263.00                           | 45.17                         | 0.007830    | 248.00                                       | 1.04                               | 789.00                                |
| 1703.00    | 11/10     | 847.00                            | 4                        | 1815.00                      | 5433.00                      | 1048.00                           | 35.78                         | 0.008210    | 200.00                                       | 1.02                               | 762.00                                |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 3                                 | 594.00                              | 15.17                              | 859.60              | 1.44                          | 1227.20              | 0.0                 | 6.40                     | 6.40                     | -0.00     | -0.00 | -0.00        |
| 8                                 | 592.00                              | 15.51                              | 493.50              | 1.51                          | 133.10               | 7.20                | 8.60                     | 15.80                    | -0.00     | -0.00 | -0.00        |
| 32                                | 678.00                              | 17.76                              | 102.20              | 1.88                          | 16.90                | 27.90               | 6.90                     | 34.80                    | -0.00     | -0.00 | -0.00        |
| 69                                | 876.00                              | 23.18                              | 18.20               | 2.60                          | 11.60                | 80.50               | 2.90                     | 81.40                    | -0.00     | -0.00 | -0.00        |
| 94                                | 1033.00                             | 28.02                              | 11.60               | 3.42                          | 1.20                 | 144.20              | 11.00                    | 155.20                   | -0.00     | -0.00 | -0.00        |
| 98                                | 1070.00                             | 29.00                              | 10.50               | 3.46                          | 1.00                 | 161.40              | 8.90                     | 170.30                   | -0.00     | -0.00 | -0.00        |
| 89                                | 1006.00                             | 26.78                              | 11.90               | 3.05                          | 1.30                 | 0.0                 | 15.50                    | 15.50                    | -0.00     | -0.00 | -0.00        |
| 49                                | 778.00                              | 20.13                              | 39.40               | 2.36                          | 2.40                 | 45.00               | 8.30                     | 53.30                    | -0.00     | -0.00 | -0.00        |
| 10                                | 608.00                              | 15.73                              | 386.50              | 1.60                          | 194.20               | 3.60                | 11.10                    | 14.70                    | -0.00     | -0.00 | -0.00        |
| 6                                 | 591.00                              | 15.13                              | 685.70              | 1.46                          | 649.30               | 3.30                | 9.60                     | 11.90                    | -0.00     | -0.00 | -0.00        |
| 4                                 | 597.00                              | 15.14                              | 917.10              | 1.47                          | 1236.80              | 4.70                | 4.20                     | 8.90                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 3                                 | 104.17                             | 85.13                              | 1.27                                | 2740.59                             | 0.0                                | 1.27                                | 112.14                  | 91.69                   | 1.37                     | 2951.61                  | 0.0                     | 1.37                     |
| 8                                 | 61.84                              | 23.92                              | 1.77                                | 2974.89                             | 1.48                               | 3.25                                | 94.24                   | 36.43                   | 2.70                     | 4530.76                  | 2.26                    | 4.96                     |
| 32                                | 10.79                              | 1.07                               | 1.20                                | 3117.99                             | 4.84                               | 6.03                                | 38.54                   | 7.65                    | 4.28                     | 11153.05                 | 17.30                   | 21.58                    |
| 69                                | 1.40                               | 0.51                               | 0.37                                | 3144.15                             | 10.14                              | 10.51                               | 10.88                   | 3.97                    | 2.85                     | 24411.91                 | 79.91                   | 81.86                    |
| 94                                | 0.64                               | 0.04                               | 1.05                                | 3136.57                             | 13.83                              | 14.88                               | 7.62                    | 0.45                    | 11.87                    | 35302.11                 | 155.60                  | 167.47                   |
| 98                                | 0.61                               | 0.03                               | 0.84                                | 3136.70                             | 15.30                              | 16.14                               | 7.21                    | 0.79                    | 10.04                    | 37342.43                 | 182.10                  | 192.14                   |
| 89                                | 0.76                               | 0.05                               | 1.67                                | 3136.39                             | 0.0                                | 1.67                                | 8.12                    | 0.51                    | 17.36                    | 32684.30                 | 0.0                     | 17.36                    |
| 49                                | 3.24                               | 0.12                               | 1.15                                | 3132.33                             | 6.24                               | 7.40                                | 17.56                   | 0.63                    | 6.23                     | 16955.30                 | 33.80                   | 40.03                    |
| 10                                | 46.55                              | 13.40                              | 2.20                                | 3027.85                             | 0.71                               | 2.91                                | 78.76                   | 22.67                   | 3.72                     | 5123.13                  | 1.21                    | 4.92                     |
| 6                                 | 85.93                              | 46.60                              | 1.77                                | 2874.87                             | 0.68                               | 2.45                                | 108.53                  | 58.86                   | 2.24                     | 3630.96                  | 0.86                    | 3.09                     |
| 4                                 | 108.69                             | 83.93                              | 0.82                                | 2736.72                             | 0.91                               | 1.73                                | 113.91                  | 87.96                   | 0.86                     | 2868.08                  | 0.96                    | 1.82                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 3                                 | 148.331           | 3904.250               | 121.282            | 0.0               | 1.814                  | 1.814                  |
| 8                                 | 53.034            | 2549.667               | 20.502             | 1.271             | 1.518                  | 2.789                  |
| 32                                | 5.693             | 1645.478               | 0.539              | 2.553             | 0.631                  | 3.184                  |
| 69                                | 0.743             | 1668.848               | 0.271              | 5.402             | 0.195                  | 5.596                  |
| 94                                | 0.384             | 1777.996               | 0.023              | 7.837             | 0.598                  | 8.435                  |
| 98                                | 0.348             | 1807.938               | 0.019              | 8.792             | 0.485                  | 9.277                  |
| 89                                | 0.471             | 1737.511               | 0.027              | 0.0               | 0.923                  | 0.923                  |
| 49                                | 1.701             | 1642.160               | 0.061              | 3.273             | 0.604                  | 3.877                  |
| 10                                | 34.395            | 2237.173               | 9.898              | 0.526             | 1.622                  | 2.149                  |
| 6                                 | 80.455            | 2691.597               | 43.637             | 0.636             | 1.657                  | 2.293                  |
| 4                                 | 134.482           | 3386.160               | 103.848            | 1.132             | 1.011                  | 2.143                  |

CAL ID NUMBER: 62 ENGINE TYPE AND MODEL: JT3D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-315-44

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 1050.0        | 69.488                    | 693.896               | 1.000              | 19.00                   | 22.005             | 219.73               | 100.142               | 332.50            | 0.06618            |
| TAKEOFF   | 1.000               | 21000.0       | 28.644                    | 12006.102             | 1.000              | 0.70                    | 0.334              | 140.07               | 2.386                 | 245.00            | 0.00136            |
| CLIMBOUT  | 0.850               | 17850.0       | 15.853                    | 9972.348              | 1.000              | 2.20                    | 0.581              | 365.65               | 1.590                 | 654.50            | 0.00089            |
| APPROACH  | 0.400               | 8400.0        | 38.032                    | 4482.105              | 1.000              | 4.00                    | 2.535              | 298.81               | 8.485                 | 560.00            | 0.00453            |
| TAXI-IDLE | 0.050               | 1050.0        | 69.488                    | 693.896               | 1.000              | 7.00                    | 8.107              | 80.95                | 100.142               | 122.50            | 0.06618            |

TOTAL FOR CYCLE: 33.562 1105.22 1914.50  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 30.367  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 17.531  
 LBS POLLUTANT/1000K LB TH AT T.O.: 1.591

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 1050.0        | 56.082                    | 693.896               | 1.000              | 19.00                   | 17.759             | 219.73               | 80.822                | 332.50            | 0.05341            |
| TAKEOFF   | 1.000               | 21000.0       | 12.534                    | 12006.102             | 1.000              | 0.70                    | 0.146              | 140.07               | 1.044                 | 245.00            | 0.00060            |
| CLIMBOUT  | 0.850               | 17850.0       | 11.410                    | 9972.348              | 1.000              | 2.20                    | 0.418              | 365.65               | 1.144                 | 654.50            | 0.00064            |
| APPROACH  | 0.400               | 8400.0        | 4.679                     | 4482.105              | 1.000              | 4.00                    | 0.312              | 298.81               | 1.044                 | 560.00            | 0.00056            |
| TAXI-IDLE | 0.050               | 1050.0        | 56.082                    | 693.896               | 1.000              | 7.00                    | 6.543              | 80.95                | 80.822                | 122.50            | 0.05341            |

TOTAL FOR CYCLE: 25.179 1105.22 1914.50  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 22.782  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.152  
 LBS POLLUTANT/1000K LB TH AT T.O.: 6.964

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 1050.0        | 1.306                     | 693.896               | 1.000              | 19.00                   | 0.413               | 219.73               | 1.882                 | 332.50            | 0.00124            |
| TAKEOFF   | 1.000               | 21000.0       | 199.107                   | 12006.102             | 1.000              | 0.70                    | 2.323               | 140.07               | 16.584                | 245.00            | 0.00948            |
| CLIMBOUT  | 0.850               | 17850.0       | 126.417                   | 9972.348              | 1.000              | 2.20                    | 4.633               | 365.65               | 12.677                | 654.50            | 0.00708            |
| APPROACH  | 0.400               | 8400.0        | 26.752                    | 4482.105              | 1.000              | 4.00                    | 1.783               | 298.81               | 5.969                 | 560.00            | 0.00318            |
| TAXI-IDLE | 0.050               | 1050.0        | 1.306                     | 693.896               | 1.000              | 7.00                    | 0.152               | 80.95                | 1.882                 | 122.50            | 0.00124            |

TOTAL FOR CYCLE: 9.307 1105.22 1914.50  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 8.421  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.862  
 LBS POLLUTANT/1000K LB TH AT T.O.: 110.615

DATE: 6/29/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBFR: 296 ENGINE TYPE AND MODEL: JT3D SERIAL NUMBER: X-315-44B

RATED THRUST: 21000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 73.00

ATMOSPHERIC PRESSURE: START 30.10 FINISH 30.06

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0118

RELATIVE HUMIDITY: 67.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 9

COMMENTS:

BURNER = B/M

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1713.00    | 1/ 0      | 1890.00            | 8                        | 2627.00          | 6902.00                  | 1579.00                 | 52.55    | 0.008150                            | 292.20                    | 1.05                         |
| 1722.00    | 2/ 1      | 6406.00            | 30                       | 4437.00          | 8582.00                  | 3540.00                 | 102.00   | 0.009730                            | 493.70                    | 1.20                         |
| 1731.00    | 3/ 2      | 14673.00           | 69                       | 5925.00          | 9627.00                  | 7907.00                 | 159.91   | 0.013930                            | 675.20                    | 1.58                         |
| 1753.00    | 4/ 3      | 20079.00           | 95                       | 6635.00          | 10152.00                 | 11344.00                | 192.46   | 0.016650                            | 771.50                    | 1.92                         |
| 1800.00    | 5/ 4      | 27433.00           | 97                       | 6675.00          | 10185.00                 | 11540.00                | 194.49   | 0.016760                            | 777.30                    | 1.94                         |
| 1813.00    | 6/ 5      | 18878.00           | 89                       | 6440.00          | 10017.00                 | 10329.00                | 185.12   | 0.015740                            | 753.00                    | 1.83                         |
| 1830.00    | 7/ 5      | 10466.00           | 49                       | 5277.00          | 9172.00                  | 5484.00                 | 133.22   | 0.011570                            | 591.50                    | 1.37                         |
| 1845.00    | 8/ 7      | 2355.00            | 11                       | 2875.00          | 7265.00                  | 1706.00                 | 58.70    | 0.008140                            | 319.30                    | 1.06                         |
| 1853.00    | 9/ 8      | 1303.00            | 6                        | 2210.00          | 6225.00                  | 1247.00                 | 45.27    | 0.007710                            | 244.80                    | 1.04                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 8                        | 605.00                     | 15.53                     | 477.00        | 1.57                 | 334.00         | 11.00         | 10.00           | 21.00           | -0.00     | -0.00 | -0.00        |
| 30                       | 690.80                     | 17.73                     | 97.00         | 1.95                 | 29.40          | 12.00         | 13.00           | 25.00           | -0.00     | -0.00 | -0.00        |
| 69                       | 913.30                     | 23.20                     | 17.10         | 2.93                 | 2.60           | 0.0           | 7.90            | 7.90            | -0.00     | -0.00 | -0.00        |
| 95                       | 1049.20                    | 28.01                     | 11.30         | 3.49                 | 1.90           | 151.00        | 8.00            | 159.00          | -0.00     | -0.00 | -0.00        |
| 97                       | 1058.80                    | 28.36                     | 11.50         | 3.50                 | 1.50           | 156.00        | 9.00            | 165.00          | -0.00     | -0.00 | -0.00        |
| 89                       | 1002.80                    | 26.70                     | 11.60         | 3.26                 | 1.40           | 127.30        | 8.80            | 136.10          | -0.00     | -0.00 | -0.00        |
| 49                       | 774.80                     | 20.15                     | 36.60         | 2.32                 | 1.50           | 48.70         | 8.60            | 57.30           | -0.00     | -0.00 | -0.00        |
| 11                       | 674.00                     | 15.70                     | 400.60        | 1.59                 | 187.70         | 9.10          | 11.10           | 20.40           | -0.00     | -0.00 | -0.00        |
| 6                        | 585.30                     | 15.31                     | 686.40        | 1.40                 | 649.80         | 9.20          | 5.00            | 14.20           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 8                        | 57.69                     | 23.14                     | 1.99                       | 2983.67                    | 2.19                      | 4.17                       | 88.21             | 35.38             | 3.04               | 4561.95            | 3.34              | 6.38               |
| 30                       | 9.87                      | 1.71                      | 2.17                       | 3117.54                    | 2.01                      | 4.18                       | 34.94             | 6.07              | 7.69               | 11036.09           | 7.10              | 14.79              |
| 69                       | 1.16                      | 0.10                      | 0.88                       | 3135.64                    | 0.0                       | 0.88                       | 9.21              | 0.80              | 6.99               | 24793.46           | 0.0               | 6.99               |
| 95                       | 0.65                      | 0.06                      | 0.75                       | 3136.56                    | 14.19                     | 14.94                      | 7.33              | 0.71              | 8.53               | 35581.11           | 160.94            | 169.46             |
| 97                       | 0.66                      | 0.05                      | 0.84                       | 3136.58                    | 14.61                     | 15.46                      | 7.57              | 0.57              | 9.73               | 36196.13           | 168.66            | 178.39             |
| 89                       | 0.71                      | 0.05                      | 0.89                       | 3136.49                    | 12.80                     | 13.69                      | 7.34              | 0.51              | 9.14               | 32396.84           | 132.25            | 141.39             |
| 49                       | 3.15                      | 0.07                      | 1.21                       | 3132.60                    | 6.87                      | 8.09                       | 17.25             | 0.40              | 6.66               | 17179.17           | 37.70             | 44.36              |
| 11                       | 48.52                     | 13.02                     | 2.25                       | 3025.79                    | 1.81                      | 4.06                       | 82.77             | 22.21             | 3.84               | 5162.00            | 3.09              | 6.92               |
| 6                        | 89.38                     | 48.46                     | 1.07                       | 2864.36                    | 1.97                      | 3.04                       | 111.46            | 60.43             | 1.33               | 3571.86            | 2.45              | 3.79               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 8                        | 46.673         | 2413.732         | 18.717          | 1.768          | 1.607            | 3.375            |
| 30                       | 5.454          | 1722.773         | 0.947           | 1.108          | 1.201            | 2.309            |
| 69                       | 0.628          | 1699.734         | 0.055           | 0.0            | 0.476            | 0.476            |
| 95                       | 0.365          | 1772.056         | 0.035           | 8.015          | 0.425            | 8.440            |
| 97                       | 0.370          | 1771.456         | 0.028           | 8.254          | 0.476            | 8.730            |
| 89                       | 0.389          | 1716.117         | 0.027           | 7.006          | 0.484            | 7.490            |
| 49                       | 1.648          | 1641.427         | 0.039           | 3.602          | 0.636            | 4.238            |
| 11                       | 35.148         | 2191.931         | 9.432           | 1.311          | 1.629            | 2.940            |
| 6                        | 85.538         | 2741.260         | 46.378          | 1.883          | 1.023            | 2.907            |

WORTHINGTON ENGINE CO. LTD.

CONSULTANTS LTD.

CAL ID NUMBER: 296 ENGINE TYPE AND MODEL: JT3D SERIAL NUMBER: X-315-448  
TEST ORGANIZATION: PRATT & WHITNEY

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 1050.0        | 113.292                   | 996.449               | 1.000              | 19.00                   | 35.876             | 315.54               | 113.696               | 332.50            | 0.10790            |
| TAKEOFF                            | 1.000               | 21000.0       | 14.620                    | 11832.008             | 1.000              | 0.70                    | 0.171              | 138.04               | 1.236                 | 245.00            | 0.00070            |
| CLIMBOUT                           | 0.850               | 17850.0       | 9.295                     | 9850.836              | 1.000              | 2.20                    | 0.341              | 361.20               | 0.944                 | 654.50            | 0.00052            |
| APPROACH                           | 0.400               | 8400.0        | 28.414                    | 4549.711              | 1.000              | 4.00                    | 1.894              | 303.31               | 6.245                 | 560.00            | 0.00338            |
| TAXI-IDLE                          | 0.050               | 1050.0        | 113.292                   | 996.449               | 1.000              | 7.00                    | 13.217             | 116.25               | 113.696               | 122.50            | 0.10790            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 51.499             | 1234.35              |                       | 1914.50           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 41.722             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 26.899             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.812              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 1050.0        | 105.495                   | 996.449               | 1.000              | 19.00                   | 33.407             | 315.54               | 105.871               | 332.50            | 0.10047            |
| TAKEOFF                            | 1.000               | 21000.0       | 3.504                     | 11832.008             | 1.000              | 0.70                    | 0.041              | 138.04               | 0.296                 | 245.00            | 0.00017            |
| CLIMBOUT                           | 0.850               | 17850.0       | 1.783                     | 9850.836              | 1.000              | 2.20                    | 0.065              | 361.20               | 0.181                 | 654.50            | 0.00010            |
| APPROACH                           | 0.400               | 8400.0        | 5.142                     | 4549.711              | 1.000              | 4.00                    | 0.343              | 303.31               | 1.130                 | 560.00            | 0.00061            |
| TAXI-IDLE                          | 0.050               | 1050.0        | 105.495                   | 996.449               | 1.000              | 7.00                    | 12.308             | 116.25               | 105.871               | 122.50            | 0.10047            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 46.163             | 1234.35              |                       | 1914.50           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 37.399             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 24.112             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.947              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 1050.0        | 2.517                     | 996.449               | 1.000              | 19.00                   | 0.797               | 315.54               | 2.526                 | 332.50            | 0.00240            |
| TAKEOFF                            | 1.000               | 21000.0       | 193.981                   | 11832.008             | 1.000              | 0.70                    | 2.263               | 138.04               | 16.395                | 245.00            | 0.00924            |
| CLIMBOUT                           | 0.850               | 17850.0       | 122.215                   | 9850.836              | 1.000              | 2.20                    | 4.481               | 361.20               | 12.407                | 654.50            | 0.00685            |
| APPROACH                           | 0.400               | 8400.0        | 27.197                    | 4549.711              | 1.000              | 4.00                    | 1.813               | 303.31               | 5.978                 | 560.00            | 0.00324            |
| TAXI-IDLE                          | 0.050               | 1050.0        | 2.517                     | 996.449               | 1.000              | 7.00                    | 0.294               | 116.25               | 2.526                 | 122.50            | 0.00240            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.648               | 1234.35              |                       | 1914.50           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.816               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.040               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 107.767             |                      |                       |                   |                    |

DATE: 6/29/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 297 ENGINE TYPE AND MODEL: JT3D

SERIAL NUMBER: X-315-44C

RATED THRUST: 21000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANF OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-5

FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 68.00

ATMOSPHERIC PRESSURE: START 30.08 FINISH 30.09

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 77.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

BURNER = B/M

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 2055.00    | 1/ 0      | 857.00                   | 4                  | 1815.00          | 5445.00                  | 1136.00                 | 0.008830 | 195.00                              | 1.02                      | 797.00                       |
| 2110.00    | 2/ 1      | 1911.00                  | 9                  | 2617.00          | 6880.00                  | 1604.00                 | 0.008820 | 285.00                              | 1.05                      | 898.00                       |
| 2122.00    | 3/ 2      | 6487.00                  | 30                 | 4433.00          | 8557.00                  | 3657.00                 | 0.010010 | 486.00                              | 1.20                      | 1178.00                      |
| 2124.00    | 4/ 3      | 14613.00                 | 69                 | 5902.00          | 9580.00                  | 8034.00                 | 0.014000 | 666.00                              | 1.58                      | 1579.00                      |
| 2140.00    | 5/ 4      | 19723.00                 | 93                 | 6609.00          | 10108.00                 | 11472.00                | 0.016810 | 761.00                              | 1.92                      | 1830.00                      |
| 2149.00    | 6/ 5      | 20314.00                 | 96                 | 6697.00          | 10179.00                 | 11946.00                | 0.017190 | 774.00                              | 1.96                      | 1864.00                      |
| 2204.00    | 7/ 6      | 18735.00                 | 89                 | 6455.00          | 10000.00                 | 10665.00                | 0.016070 | 739.00                              | 1.84                      | 1768.00                      |
| 2211.00    | 8/ 7      | 10480.00                 | 49                 | 5270.00          | 9138.00                  | 5625.00                 | 0.011800 | 584.00                              | 1.37                      | 1380.00                      |
| 2228.00    | 9/ 8      | 2371.00                  | 11                 | 2870.00          | 7240.00                  | 1769.00                 | 0.008330 | 312.00                              | 1.04                      | 893.00                       |
| 2234.00    | 10/ 9     | 1307.00                  | 6                  | 2200.00          | 6182.00                  | 1314.00                 | 0.008110 | 236.00                              | 1.04                      | 796.00                       |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 583.00                     | 15.10                     | 980.60        | 1.39                 | 1674.00        | 7.80          | 1.40            | 9.20            | -0.00     | -0.00 | -0.00        |
| 9                        | 594.00                     | 15.43                     | 620.90        | 1.62                 | 570.10         | 4.80          | 5.90            | 10.70           | -0.00     | -0.00 | -0.00        |
| 30                       | 678.00                     | 17.70                     | 126.60        | 2.02                 | 31.50          | 21.00         | 9.90            | 30.90           | -0.00     | -0.00 | -0.00        |
| 69                       | 882.00                     | 23.15                     | 23.00         | 2.93                 | 8.00           | 72.50         | 5.90            | 78.40           | -0.00     | -0.00 | -0.00        |
| 93                       | 1038.00                    | 27.90                     | 12.30         | 3.63                 | 5.40           | 136.30        | 5.30            | 141.60          | -0.00     | -0.00 | -0.00        |
| 96                       | 1058.00                    | 28.60                     | 11.60         | 3.71                 | 3.50           | 150.00        | 6.70            | 156.70          | -0.00     | -0.00 | -0.00        |
| 89                       | 1000.00                    | 26.90                     | 13.40         | 3.36                 | 3.10           | 118.70        | 6.40            | 125.10          | -0.00     | -0.00 | -0.00        |
| 49                       | 767.00                     | 20.10                     | 51.80         | 2.37                 | 5.10           | 41.90         | 7.90            | 49.80           | -0.00     | -0.00 | -0.00        |
| 11                       | 596.00                     | 15.70                     | 483.30        | 1.69                 | 313.30         | 10.50         | 4.90            | 15.40           | -0.00     | -0.00 | -0.00        |
| 6                        | 575.00                     | 15.30                     | 866.70        | 1.51                 | 1159.80        | 7.20          | 2.70            | 9.90            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 118.55                    | 115.90                    | 0.28                       | 2640.29                    | 1.55                      | 1.83                       | 134.67            | 131.67            | 0.32               | 2999.37            | 1.76              | 2.08               |
| 9                        | 71.45                     | 37.59                     | 1.17                       | 2929.14                    | 0.91                      | 2.02                       | 114.61            | 60.24             | 1.79               | 4698.34            | 1.46              | 3.24               |
| 30                       | 12.45                     | 1.77                      | 1.60                       | 3120.10                    | 3.39                      | 4.99                       | 45.51             | 6.47              | 5.85               | 11410.22           | 12.40             | 18.25              |
| 69                       | 1.57                      | 0.31                      | 0.64                       | 3141.20                    | 8.13                      | 8.79                       | 12.61             | 2.51              | 5.31               | 25236.41           | 65.28             | 70.59              |
| 93                       | 0.58                      | 0.17                      | 0.48                       | 3142.99                    | 12.34                     | 12.82                      | 7.78              | 1.96              | 5.50               | 36056.39           | 141.53            | 147.04             |
| 96                       | 0.63                      | 0.11                      | 0.59                       | 3143.24                    | 13.29                     | 13.88                      | 7.47              | 1.29              | 7.09               | 37549.19           | 158.71            | 165.80             |
| 89                       | 0.80                      | 0.11                      | 0.63                       | 3142.98                    | 11.61                     | 12.23                      | 8.51              | 1.13              | 6.67               | 33519.89           | 123.79            | 130.47             |
| 49                       | 4.36                      | 0.25                      | 1.09                       | 3136.94                    | 5.80                      | 6.89                       | 24.55             | 1.38              | 6.15               | 17645.58           | 32.61             | 38.76              |
| 11                       | 54.46                     | 20.29                     | 0.91                       | 3002.98                    | 1.95                      | 2.86                       | 96.69             | 35.90             | 1.61               | 5312.26            | 3.45              | 5.06               |
| 6                        | 101.28                    | 77.62                     | 0.52                       | 2772.45                    | 1.38                      | 1.90                       | 133.08            | 101.99            | 0.68               | 3642.99            | 1.87              | 2.50               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 157.140        | 3499.844         | 153.637         | 2.053          | 0.369            | 2.422            |
| 9                        | 59.973         | 2458.575         | 31.549          | 0.762          | 0.936            | 1.698            |
| 30                       | 7.016          | 1758.936         | 1.000           | 1.912          | 0.901            | 2.813            |
| 69                       | 0.863          | 1726.983         | 0.172           | 4.467          | 0.364            | 4.831            |
| 93                       | 0.394          | 1823.140         | 0.099           | 7.176          | 0.279            | 7.455            |
| 96                       | 0.369          | 1848.439         | 0.064           | 7.813          | 0.349            | 8.162            |
| 89                       | 0.454          | 1789.160         | 0.060           | 6.608          | 0.356            | 6.964            |
| 49                       | 2.342          | 1683.739         | 0.132           | 3.112          | 0.587            | 3.699            |
| 11                       | 40.779         | 2240.516         | 15.140          | 1.455          | 0.679            | 2.134            |
| 6                        | 101.821        | 2787.295         | 78.036          | 1.389          | 0.521            | 1.910            |



DATE: 6/30/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 298 ENGINE TYPE AND MODEL: JT3D SERIAL NUMBER: X-315-440  
 RATED THRUST: 21000.  
 ENGINE TOTAL TIME: -0. HRS  
 TIME SINCE HOT SECTION OVERHAUL: -0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: -0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
 N1 TURBINE OVERHAUL: -0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS  
 FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 81.00 FINISH 87.00  
 ATMOSPHERIC PRESSURE: START 30.00 FINISH 29.88  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0170  
 RELATIVE HUMIDITY: 73.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

BURNER = B/M

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2       | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|--------------------|------------------|----------|----------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1030.00    | 1/ 0      | 9188.00            | 43                       |                    | 5124.00          | 9085.00  | 5083.00  | 123.91                   | 0.011530                | 578.50   | 1.32                                | 1359.00                   |                              |
| 1212.00    | 2/ 1      | 18606.00           | 88                       |                    | 6570.00          | 10145.00 | 11059.00 | 184.71                   | 0.016910                | 773.70   | 1.85                                | 1847.00                   |                              |
| 1321.00    | 3/ 2      | 16413.00           | 78                       |                    | 6289.00          | 9955.00  | 9444.00  | 171.72                   | 0.015510                | 737.00   | 1.72                                | 1733.00                   |                              |
| 1533.00    | 4/ 3      | 1748.00            | 8                        |                    | 1806.00          | 5440.00  | 1105.00  | 34.21                    | 0.008800                | 217.70   | 1.02                                | 816.00                    |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 43                       | 769.80                     | 19.40                     | 63.50         | 2.27                 | 5.40           | 37.40         | 6.00            | 43.40           | -0.00     | -0.00 | -0.00        |
| 88                       | 1053.30                    | 27.07                     | 12.50         | 3.55                 | 1.10           | 134.70        | 6.00            | 140.70          | -0.00     | -0.00 | -0.00        |
| 78                       | 989.80                     | 24.98                     | 14.10         | 3.40                 | 4.60           | 0.0           | 3.50            | 3.50            | -0.00     | -0.00 | -0.00        |
| 8                        | 626.70                     | 15.06                     | 466.60        | 1.57                 | 1650.00        | 9.30          | 2.10            | 11.40           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 43                       | 5.58                      | 0.27                      | 0.87                       | 3135.01                    | 5.40                      | 6.27                       | 28.37             | 1.38              | 4.40               | 15935.25           | 27.45             | 31.85              |
| 88                       | 0.70                      | 0.04                      | 0.56                       | 3143.32                    | 12.47                     | 13.02                      | 7.79              | 0.39              | 6.14               | 34761.98           | 137.89            | 144.03             |
| 78                       | 0.83                      | 0.15                      | 0.34                       | 3142.80                    | 0.0                       | 0.34                       | 7.83              | 1.46              | 3.19               | 29680.56           | 0.0               | 3.19               |
| 8                        | 52.41                     | 106.15                    | 0.39                       | 2770.96                    | 1.72                      | 2.10                       | 57.92             | 117.30            | 0.43               | 3061.91            | 1.90              | 2.32               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 43                       | 3.098          | 1734.354         | 0.150           | 2.987          | 0.479            | 3.466            |
| 88                       | 0.419          | 1868.322         | 0.021           | 7.411          | 0.330            | 7.741            |
| 78                       | 0.477          | 1808.357         | 0.089           | 0.0            | 0.195            | 0.195            |
| 8                        | 33.133         | 1751.663         | 67.103          | 1.085          | 0.245            | 1.330            |



DATE: 7/21/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 292 ENGINE TYPE AND MODEL: JT3D-1

SERIAL NUMBER: 642590

RATED THRUST: 17000.

ENGINE TOTAL TIME: 21605. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A

FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 85.00

ATMOSPHERIC PRESSURE: START 29.32 FINISH 29.32

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0080

RELATIVE HUMIDITY: 27.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 134.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C IS CAL-ESTIMATED  
 USED SPEY PROBE LOCATED ONE PIPE O/A  
 DOWNSTREAM DUE TO LOCATION OF A.A. SUPPORT STAND.  
 SAMPLE LINE TEMP. AVERAGED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 130.00     | 5/ 0      | 8400.00                  | 49                 | 5218.00          | 8947.00 | 4500.00 | -0.00                    | -0.000000               | -0.00    | 1.32                                | -0.00                     |                              |
| 135.00     | 4/ 5      | 930.00                   | 5                  | 1950.00          | 5592.00 | 900.00  | -0.00                    | -0.000000               | -0.00    | 1.04                                | -0.00                     |                              |
| 145.00     | 1/ 4      | 8750.00                  | 51                 | 5270.00          | 8980.00 | 4690.00 | -0.00                    | -0.000000               | -0.00    | 1.34                                | -0.00                     |                              |
| 150.00     | 2/ 1      | 11610.00                 | 68                 | 5876.00          | 9410.00 | 6390.00 | -0.00                    | -0.000000               | -0.00    | 1.50                                | -0.00                     |                              |
| 200.00     | 3/ 2      | 14360.00                 | 84                 | 6370.00          | 9750.00 | 8170.00 | -0.00                    | -0.000000               | -0.00    | 1.70                                | -0.00                     |                              |

9473

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 49                       | 740.00                     | 18.44                     | 55.00         | 2.33                 | 5.80           | 36.70         | 22.00           | 58.70           | 0.92      | -0.00 | -0.00        |
| 5                        | 570.00                     | 14.92                     | 700.00        | 1.39                 | 1469.00        | 0.0           | 10.00           | 10.00           | 38.40     | -0.00 | -0.00        |
| 51                       | 750.00                     | 18.68                     | 50.50         | 2.16                 | 6.30           | 37.70         | 23.00           | 60.70           | 0.65      | -0.00 | -0.00        |
| 68                       | 825.00                     | 20.88                     | 29.20         | 2.52                 | 4.30           | 60.60         | 14.00           | 74.60           | 0.32      | -0.00 | -0.00        |
| 84                       | 900.00                     | 23.25                     | 20.00         | 2.80                 | 3.00           | 86.80         | 20.00           | 106.80          | 0.31      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 49                       | 4.73                      | 0.29                      | 3.11                       | 3147.68                    | 5.18                      | 8.29                       | 21.28             | 1.29              | 13.98              | 14164.54           | 23.32             | 37.30              |
| 5                        | 87.50                     | 105.16                    | 2.05                       | 2729.91                    | 0.0                       | 2.05                       | 78.75             | 94.65             | 1.85               | 2456.92            | 0.0               | 1.85               |
| 51                       | 4.29                      | 0.31                      | 3.21                       | 3148.31                    | 5.26                      | 8.47                       | 20.11             | 1.44              | 15.04              | 14765.59           | 24.66             | 39.70              |
| 68                       | 2.32                      | 0.20                      | 1.83                       | 3151.70                    | 7.92                      | 9.75                       | 14.85             | 1.25              | 11.70              | 20139.36           | 50.63             | 62.33              |
| 84                       | 1.43                      | 0.12                      | 2.35                       | 3153.30                    | 10.22                     | 12.57                      | 11.71             | 1.01              | 19.24              | 25762.44           | 83.49             | 102.73             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 49                       | 2.533          | 1686.254         | 0.153           | 2.777          | 1.664            | 4.441            |
| 5                        | 84.674         | 2641.845         | 101.770         | 0.0            | 1.987            | 1.987            |
| 51                       | 2.298          | 1687.496         | 0.164           | 2.818          | 1.719            | 4.537            |
| 68                       | 1.279          | 1734.657         | 0.108           | 4.361          | 1.007            | 5.368            |
| 84                       | 0.816          | 1794.042         | 0.070           | 5.814          | 1.340            | 7.154            |

CAL ID NUMBER: 292 ENGINE TYPE AND MODEL: JT30-1  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 642590

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 850.0         | 70.546                    | 846.397               | 1.000              | 19.00                   | 22.340             | 268.03               | 83.349                | 269.17            | 0.08300            |
| TAKEOFF                            | 1.000               | 17000.0       | 4.088                     | 9979.613              | 1.000              | 0.70                    | 0.048              | 116.43               | 0.410                 | 198.33            | 0.00024            |
| CLIMBOUT                           | 0.850               | 14450.0       | 8.920                     | 8282.012              | 1.000              | 2.20                    | 0.327              | 303.67               | 1.077                 | 529.83            | 0.00062            |
| APPROACH                           | 0.400               | 6800.0        | 14.147                    | 3797.192              | 1.000              | 4.00                    | 2.276              | 253.15               | 8.993                 | 453.33            | 0.00502            |
| TAXI-IDLE                          | 0.050               | 850.0         | 70.546                    | 846.397               | 1.000              | 7.00                    | 8.230              | 98.75                | 83.349                | 99.17             | 0.08300            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 33.221             | 1040.02              |                       | 1549.83           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 31.943             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 21.435             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.281              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 850.0         | 87.958                    | 846.397               | 1.000              | 19.00                   | 27.853             | 268.03               | 103.921               | 269.17            | 0.10348            |
| TAKEOFF                            | 1.000               | 17000.0       | 1.108                     | 9979.613              | 1.000              | 0.70                    | 0.013              | 116.43               | 0.111                 | 198.33            | 0.00007            |
| CLIMBOUT                           | 0.850               | 14450.0       | 1.546                     | 8282.012              | 1.000              | 2.20                    | 0.057              | 303.67               | 0.187                 | 529.83            | 0.00011            |
| APPROACH                           | 0.400               | 6800.0        | 14.371                    | 3797.192              | 1.000              | 4.00                    | 0.958              | 253.15               | 3.785                 | 453.33            | 0.00211            |
| TAXI-IDLE                          | 0.050               | 850.0         | 87.958                    | 846.397               | 1.000              | 7.00                    | 10.262             | 98.75                | 103.921               | 99.17             | 0.10348            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 39.143             | 1040.02              |                       | 1549.83           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 37.637             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 25.256             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.760              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 850.0         | 1.706                     | 846.397               | 1.000              | 19.00                   | 0.540               | 268.03               | 2.016                 | 269.17            | 0.00201            |
| TAKEOFF                            | 1.000               | 17000.0       | 141.012                   | 9979.613              | 1.000              | 0.70                    | 1.645               | 116.43               | 14.130                | 198.33            | 0.00829            |
| CLIMBOUT                           | 0.850               | 14450.0       | 100.407                   | 8282.012              | 1.000              | 2.20                    | 3.682               | 303.67               | 12.124                | 529.83            | 0.00695            |
| APPROACH                           | 0.400               | 6800.0        | 27.717                    | 3797.192              | 1.000              | 4.00                    | 1.848               | 253.15               | 7.299                 | 453.33            | 0.00408            |
| TAXI-IDLE                          | 0.050               | 850.0         | 1.706                     | 846.397               | 1.000              | 7.00                    | 0.199               | 98.75                | 2.016                 | 99.17             | 0.00201            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.914               | 1040.02              |                       | 1549.83           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.609               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.106               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 96.773              |                      |                       |                   |                    |

DATE: 7/19/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 116 ENGINE TYPE AND MODEL: JT3D -3B

SERIAL NUMBER: (TWA2304)

RATED THRUST: 18000.

ENGINE TOTAL TIME: 15372. HRS

TIME SINCE HOT SECTION OVERHAUL: 74. HPS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 15372. HRS  
N2 COMPRESSOR OVERHAUL: 15372. HRS  
COMBUSTOR CAN REPLACEMENT: 74. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 15372. HRS  
N1 TURBINE OVERHAUL: 15372. HRS  
N2 TURBINE OVERHAUL: 15372. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 63.00 FINISH 64.00

ATMOSPHERIC PRESSURE: START 28.92 FINISH 28.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0107

RELATIVE HUMIDITY: 75.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | THRUST, LBS SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|-----------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 11960.00        | 61                       | 5785.00          | 9220.00                  | 6170.00                 | 139.80   | 0.012300                            | -0.00                     | -0.00                        |
| 10.00        | 2/ 1      | 13200.00        | 73                       | 6180.00          | 7660.00                  | 7590.00                 | 154.20   | 0.013700                            | -0.00                     | -0.00                        |
| 25.00        | 3/ 2      | 15400.00        | 85                       | 6510.00          | 9850.00                  | 9190.00                 | 171.50   | 0.014900                            | -0.00                     | -0.00                        |
| 33.00        | 4/ 3      | 10600.00        | 5                        | 3710.00          | 6220.00                  | 1070.00                 | 38.60    | 0.007700                            | -0.00                     | -0.00                        |
| 40.00        | 5/ 4      | 15400.00        | 85                       | 6510.00          | 9820.00                  | 9230.00                 | 171.50   | 0.015000                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOX (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 61                       | 761.00                     | 6.40                      | 26.00         | 1.60                | 52.00          | 27.00         | 5.00           | 32.00          | -0.00     | -0.00 | -0.00        |
| 73                       | 825.00                     | 8.50                      | 20.00         | 2.04                | 65.00          | 44.00         | 6.00           | 50.00          | -0.00     | -0.00 | -0.00        |
| 85                       | 914.00                     | 10.80                     | 14.00         | 2.51                | 68.00          | 71.00         | 4.00           | 75.00          | -0.00     | -0.00 | -0.00        |
| 5                        | 504.00                     | 0.30                      | 658.00        | 1.39                | 1060.00        | 0.00          | 7.00           | 7.00           | -0.00     | -0.00 | -0.00        |
| 85                       | 917.00                     | 10.60                     | 11.00         | 2.44                | 70.00          | 70.00         | 5.00           | 75.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 61                       | 3.22                      | 3.69                      | 1.02                       | 3118.04                    | 5.50                      | 6.52                       | 19.90             | 22.79             | 6.28               | 19238.31           | 33.94             | 40.22              |
| 73                       | 1.95                      | 3.62                      | 0.96                       | 3120.24                    | 7.04                      | 7.99                       | 14.78             | 27.51             | 7.28               | 23682.63           | 53.40             | 60.68              |
| 85                       | 1.11                      | 3.08                      | 0.52                       | 3123.04                    | 9.24                      | 9.76                       | 10.19             | 28.34             | 4.78               | 26700.71           | 84.87             | 89.65              |
| 5                        | 94.01                     | 77.51                     | 1.47                       | 2788.58                    | 0.00                      | 1.47                       | 89.90             | 92.94             | 1.57               | 2983.78            | 0.00              | 1.57               |
| 85                       | 0.90                      | 3.27                      | 0.67                       | 3122.87                    | 9.37                      | 10.03                      | 8.27              | 30.14             | 6.17               | 28824.11           | 86.45             | 92.62              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO2 LB/1K#TH-HR | NOX LB/1K#TH-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 61                       | 1.799          | 1739.449        | 2.061           | 3.069          | 0.568           | 3.637           |
| 73                       | 1.119          | 1794.139        | 2.084           | 4.049          | 0.552           | 4.597           |
| 85                       | 0.662          | 1863.682        | 1.840           | 5.511          | 0.310           | 5.822           |
| 5                        | 94.007         | 2814.889        | 78.246          | 0.00           | 1.482           | 1.482           |
| 85                       | 0.537          | 1971.696        | 1.957           | 5.613          | 0.401           | 6.014           |

CAL ID NUMBER: 116 ENGINE TYPE AND MODEL: JT3D -3B  
TEST ORGANIZATION: S W R I TMA

SERIAL NUMBER: (TWA2304)

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 292.230                   | 991.115               | 1.000              | 19.00                   | 92.539             | 313.85               | 294.850               | 285.00            | 0.32470            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 11218.996             | 1.000              | 0.70                    | 0.0                | 130.89               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 6.702                     | 9176.582              | 1.000              | 2.20                    | 0.246              | 336.47               | 0.730                 | 561.00            | 0.00044            |
| APPROACH  | 0.400               | 7200.0        | 17.412                    | 4395.953              | 1.000              | 4.00                    | 1.161              | 293.06               | 3.961                 | 480.00            | 0.00242            |
| TAXI-IDLE | 0.050               | 900.0         | 292.230                   | 991.115               | 1.000              | 7.00                    | 34.093             | 115.63               | 294.850               | 105.00            | 0.32470            |

TOTAL FOR CYCLE: 128.039 1189.91 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 107.604  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 78.025  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 214.801                   | 991.115               | 1.000              | 19.00                   | 68.020             | 313.85               | 216.726               | 285.00            | 0.23867            |
| TAKEOFF   | 1.000               | 18000.0       | 27.784                    | 11218.996             | 1.000              | 0.70                    | 0.324              | 130.89               | 2.477                 | 210.00            | 0.00154            |
| CLIMBOUT  | 0.850               | 15300.0       | 27.207                    | 9176.582              | 1.000              | 2.20                    | 0.998              | 336.47               | 2.965                 | 561.00            | 0.00178            |
| APPROACH  | 0.400               | 7200.0        | 19.179                    | 4395.953              | 1.000              | 4.00                    | 1.279              | 293.06               | 4.363                 | 480.00            | 0.00266            |
| TAXI-IDLE | 0.050               | 900.0         | 214.801                   | 991.115               | 1.000              | 7.00                    | 25.060             | 115.63               | 216.726               | 105.00            | 0.23867            |

TOTAL FOR CYCLE: 95.681 1189.91 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 80.410  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 58.306  
LBS POLLUTANT/1000K LB TH AT T.O.: 18.008

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 1.133                     | 991.115               | 1.000              | 19.00                   | 0.359               | 313.85               | 1.144                 | 285.00            | 0.00126            |
| TAKEOFF   | 1.000               | 18000.0       | 146.115                   | 11218.996             | 1.000              | 0.70                    | 1.705               | 130.89               | 13.024                | 210.00            | 0.00812            |
| CLIMBOUT  | 0.850               | 15300.0       | 89.862                    | 9176.582              | 1.000              | 2.20                    | 3.295               | 336.47               | 9.793                 | 561.00            | 0.00587            |
| APPROACH  | 0.400               | 7200.0        | 19.761                    | 4395.953              | 1.000              | 4.00                    | 1.317               | 293.06               | 4.495                 | 480.00            | 0.00274            |
| TAXI-IDLE | 0.050               | 900.0         | 1.133                     | 991.115               | 1.000              | 7.00                    | 0.132               | 115.63               | 1.144                 | 105.00            | 0.00126            |

TOTAL FOR CYCLE: 6.808 1189.91 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.722  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.149  
LBS POLLUTANT/1000K LB TH AT T.O.: 94.704

DATE: 7/19/71

TEST ORGANIZATION: S W R T W A

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 117 ENGINE TYPE AND MODEL: JT3D -30

SERIAL NUMBER: (TWA3102)

RATED THRUST: 13000.

ENGINE TOTAL TIME: 9463. HRS

TIME SINCE HOT SECTION OVERHAUL: 9463. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9463. HRS  
N2 COMPRESSOR OVERHAUL: 9463. HRS  
COMBUSTION CAN REPLACEMENT: 9463. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 9463. HRS  
N1 TURBINE OVERHAUL: 9463. HRS  
N2 TURBINE OVERHAUL: 9463. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 28.97 FINISH 28.96

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0101

RELATIVE HUMIDITY: 46.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

F/A AND AIRFUEL CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS<br>RATED<br>SHR | PERCENT<br>RATED<br>T.O. | ENGINE SPEED<br>RPM<br>N1 N2 | MEASURED FUEL<br>FLOW<br>LB/HR | CALC. F/A<br>AIR FLOW<br>LB/SEC | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|--------------|-----------|-----------------------------------|--------------------------|------------------------------|--------------------------------|---------------------------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0          | 6/ 0      | 9120.00                           | 50                       | 5360.00 9110.00              | 5130.00                        | 126.00                          | 0.011400                                     | -0.00                              | -0.00                                 |
| 4.30         | 1/ 6      | 11200.00                          | 62                       | 5920.00 9420.00              | 6350.00                        | 142.30                          | 0.012400                                     | -0.00                              | -0.00                                 |
| 7.30         | 2/ 1      | 13320.00                          | 73                       | 6180.00 9630.00              | 7770.00                        | 158.80                          | 0.013600                                     | -0.00                              | -0.00                                 |
| 22.30        | 1/ 2      | 15500.00                          | 86                       | 6500.00 9970.00              | 9350.00                        | 173.30                          | 0.015000                                     | -0.00                              | -0.00                                 |
| 27.30        | 4/ 3      | 1800.00                           | 4                        | 1900.00 5700.00              | 480.00                         | 34.40                           | 0.007800                                     | -0.00                              | -0.00                                 |
| 32.30        | 5/ 4      | 14140.00                          | 73                       | 6320.00 9740.00              | 8500.00                        | 164.30                          | 0.014400                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WFT)<br>PPMV | CO<br>2<br>(WFT)<br>PERCENT V | THC<br>(WFT)<br>PPMV | NO<br>(WFT)<br>PPMV | NO<br>2<br>(WFT)<br>PPMV | NO<br>X<br>(WFT)<br>PPMV | ALOPHYDES | SNOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 50                                | 752.00                              | 4.70                               | 22.00               | 1.45                          | 72.00                | 22.00               | 4.00                     | 25.00                    | -0.00     | -0.00 | -0.00        |
| 62                                | 820.00                              | 6.40                               | 37.30               | 1.75                          | 76.00                | 3.70                | 3.00                     | 40.00                    | -0.00     | -0.00 | -0.00        |
| 73                                | 882.00                              | 8.50                               | 13.00               | 2.08                          | 77.00                | 58.00               | 3.00                     | 61.00                    | -0.00     | -0.00 | -0.00        |
| 86                                | 970.00                              | 0.80                               | 10.00               | 2.58                          | 43.00                | 93.00               | 4.00                     | 97.00                    | -0.00     | -0.00 | -0.00        |
| 4                                 | 575.00                              | 0.20                               | 642.00              | 1.38                          | 1340.00              | 1.00                | 6.00                     | 7.00                     | -0.00     | -0.00 | -0.00        |
| 78                                | 923.00                              | 9.30                               | 13.00               | 2.51                          | 80.00                | 75.00               | 3.00                     | 78.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS F1<br>CO<br>LB/FUEL | MASS F1<br>HC<br>LB/FUEL | MASS F1<br>N12<br>LB/FUEL | MASS F1<br>CO2<br>LB/FUEL | MASS F1<br>NO<br>LB/FUEL | MASS F1<br>NOX<br>LB/FUEL | MASS F1<br>CO<br>LB/HR | MASS F1<br>HC<br>LB/HR | MASS F1<br>N12<br>LB/HR | MASS F1<br>CO2<br>LB/HR | MASS F1<br>NO<br>LB/HR | MASS F1<br>NOX<br>LB/HR |
|-----------------------------------|--------------------------|--------------------------|---------------------------|---------------------------|--------------------------|---------------------------|------------------------|------------------------|-------------------------|-------------------------|------------------------|-------------------------|
| 50                                | 3.91                     | 5.63                     | 0.90                      | 3113.06                   | 4.94                     | 5.84                      | 15.42                  | 28.91                  | 4.61                    | 15470.01                | 25.33                  | 29.94                   |
| 62                                | 4.12                     | 6.85                     | 0.55                      | 3113.48                   | 0.68                     | 7.31                      | 26.15                  | 30.77                  | 3.48                    | 19770.57                | 4.10                   | 46.45                   |
| 73                                | 4.24                     | 4.21                     | 0.47                      | 3119.74                   | 0.09                     | 9.56                      | 32.71                  | 32.71                  | 1.65                    | 24249.39                | 70.68                  | 74.32                   |
| 86                                | 0.77                     | 4.10                     | 3.51                      | 3120.78                   | 11.76                    | 12.27                     | 7.20                   | 38.34                  | 4.73                    | 29179.32                | 109.98                 | 114.69                  |
| 4                                 | 06.06                    | 54.30                    | 1.24                      | 2724.22                   | 0.21                     | 1.44                      | 85.20                  | 97.31                  | 1.21                    | 2489.73                 | 0.20                   | 1.42                    |
| 78                                | 1.03                     | 3.63                     | 0.39                      | 3121.67                   | 0.75                     | 10.15                     | 8.75                   | 10.83                  | 3.32                    | 26534.23                | 82.49                  | 86.29                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1KTH-HR | CO<br>2<br>LB/1KTH-HR | THC<br>LB/1KTH-HR | NO<br>LB/1KTH-HR | NO<br>2<br>LB/1KTH-HR | NO<br>X<br>LB/1KTH-HR |
|-----------------------------------|------------------|-----------------------|-------------------|------------------|-----------------------|-----------------------|
| 50                                | 1.691            | 1751.047              | 2.140             | 2.777            | 0.505                 | 1.282                 |
| 62                                | 2.135            | 1755.240              | 2.747             | 0.386            | 0.111                 | 4.147                 |
| 73                                | 0.724            | 1419.950              | 2.456             | 0.305            | 0.274                 | 5.579                 |
| 86                                | 0.466            | 1842.537              | 2.474             | 7.094            | 0.305                 | 7.399                 |
| 4                                 | 01.922           | 3033.786              | 110.584           | 0.220            | 1.379                 | 1.509                 |
| 78                                | 0.619            | 1875.537              | 2.140             | 5.862            | 0.234                 | 6.096                 |

CAL ID NUMBER: 117 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: (TWA3102)  
 TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 113.893                   | 878.435               | 1.000              | 19.00                   | 36.066             | 278.17               | 129.654               | 285.00            | 0.12655            |
| TAKOFF    | 1.000               | 18000.0       | 3.828                     | 11033.723             | 1.000              | 0.70                    | 0.045              | 128.73               | 0.347                 | 210.00            | 0.00021            |
| CLIMBOUT  | 0.850               | 15300.0       | 2.428                     | 9180.453              | 1.000              | 2.20                    | 0.089              | 336.62               | 0.264                 | 561.00            | 0.00016            |
| APPROACH  | 0.400               | 7200.0        | 10.974                    | 4160.602              | 1.000              | 4.00                    | 0.732              | 277.37               | 2.638                 | 480.00            | 0.00152            |
| TAXI-IDLE | 0.050               | 900.0         | 113.893                   | 878.435               | 1.000              | 7.00                    | 13.287             | 102.48               | 129.654               | 105.00            | 0.12655            |

TOTAL FOR CYCLE: 50.219 1123.37 1641.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 44.704  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 30.603  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.248

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 98.843                    | 878.435               | 1.000              | 19.00                   | 31.300             | 278.17               | 112.521               | 285.00            | 0.10983            |
| TAKOFF    | 1.000               | 18000.0       | 36.046                    | 11033.723             | 1.000              | 0.70                    | 0.421              | 128.73               | 3.267                 | 210.00            | 0.00200            |
| CLIMBOUT  | 0.850               | 15300.0       | 34.569                    | 9180.453              | 1.000              | 2.20                    | 1.268              | 336.62               | 3.765                 | 561.00            | 0.00226            |
| APPROACH  | 0.400               | 7200.0        | 24.183                    | 4160.602              | 1.000              | 4.00                    | 1.612              | 277.37               | 5.812                 | 480.00            | 0.00336            |
| TAXI-IDLE | 0.050               | 900.0         | 98.843                    | 878.435               | 1.000              | 7.00                    | 11.532             | 102.48               | 112.521               | 105.00            | 0.10983            |

TOTAL FOR CYCLE: 46.132 1123.37 1641.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 41.066  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 28.112  
 LBS POLLUTANT/1000K LB TH AT T.O.: 23.363

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 1.299                     | 878.435               | 1.000              | 19.00                   | 0.411               | 278.17               | 1.478                 | 285.00            | 0.00144            |
| TAKOFF    | 1.000               | 18000.0       | 174.746                   | 11033.723             | 1.000              | 0.70                    | 2.039               | 128.73               | 15.837                | 210.00            | 0.00971            |
| CLIMBOUT  | 0.850               | 15300.0       | 108.525                   | 9180.453              | 1.000              | 2.20                    | 3.979               | 336.62               | 11.821                | 561.00            | 0.00709            |
| APPROACH  | 0.400               | 7200.0        | 19.580                    | 4160.602              | 1.000              | 4.00                    | 1.305               | 277.37               | 4.706                 | 480.00            | 0.00272            |
| TAXI-IDLE | 0.050               | 900.0         | 1.299                     | 878.435               | 1.000              | 7.00                    | 0.152               | 102.48               | 1.478                 | 105.00            | 0.00144            |

TOTAL FOR CYCLE: 7.886 1123.37 1641.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 7.020  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.806  
 LBS POLLUTANT/1000K LB TH AT T.O.: 113.261

DATE: 7/ 1/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 124 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: 645735  
 RATED THRUST: 18000.  
 ENGINE TOTAL TIME: 12462. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 6682. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 12462. HRS  
 N2 COMPRESSOR OVERHAUL: 16576. HRS  
 COMBUSTION CAN REPLACEMENT: 3993. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3493. HRS  
 N1 TURBINE OVERHAUL: 6682. HRS  
 N2 TURBINE OVERHAUL: 3993. HRS  
 FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 55.40 FINISH 55.40  
 ATMOSPHERIC PRESSURE: START 29.88 FINISH 29.96  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0065  
 RELATIVE HUMIDITY: 69.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00; FLOW RATE, LITERS/MIN: 1.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
 PRE-REPAIR RUN

| CLOCK TIME | TEST MODE | THRUST LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|-------------------|--------------------------|------------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 120.00     | 1/ 0      | 7300.00           | 51                       | 5165.00 8882.00        | 4928.00                  | -0.00                   | -0.000000 | -0.00                               | 1.34                      | -0.00                        |
| 130.00     | 2/ 1      | 13200.00          | 73                       | 5948.00 9334.00        | 7023.00                  | -0.00                   | -0.000000 | -0.00                               | 1.60                      | -0.00                        |
| 135.00     | 3/ 2      | 16500.00          | 91                       | 6403.00 9722.00        | 9277.00                  | -0.00                   | -0.000000 | -0.00                               | 1.84                      | -0.00                        |
| 145.00     | 4/ 3      | 1125.00           | 6                        | 2103.00 5850.00        | -0.00                    | -0.00                   | -0.000000 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 51                       | 644.00                     | 40.40                     | 95.00         | 2.18                 | 9.30           | 36.00         | -0.00           | 42.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 800.60                     | 47.20                     | 60.00         | 2.50                 | 0.90           | 60.00         | -0.00           | 64.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 912.20                     | 54.30                     | 30.00         | 2.45                 | 0.45           | 94.00         | -0.00           | 94.00           | -0.00     | -0.00 | -0.00        |
| 6                        | 536.00                     | 31.10                     | 865.00        | 1.45                 | 1920.00        | 10.80         | -0.00           | 11.40           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FUEL CO LB/1K LB FUEL | MASS FUEL HC LB/1K LB FUEL | MASS FUEL N1 LB/1K LB FUEL | MASS FUEL CO2 LB/1K LB FUEL | MASS FUEL NO LB/1K LB FUEL | MASS FUEL NOX LB/1K LB FUEL | MASS FUEL CO LB/HR | MASS FUEL HC LB/HR | MASS FUEL NO2 LB/HR | MASS FUEL CO2 LB/HR | MASS FUEL NO LB/HR | MASS FUEL N1X LB/HR |
|--------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| 51                       | 9.71                       | 0.49                       | -0.00                      | 3140.86                     | 5.42                       | 6.33                        | 42.43              | 2.41               | -0.00               | 15478.17            | 26.72              | 31.17               |
| 73                       | 4.91                       | 0.04                       | -0.00                      | 3148.27                     | 7.90                       | 8.43                        | 33.77              | 0.29               | -0.00               | 22109.94            | 55.47              | 59.17               |
| 91                       | 2.11                       | 0.02                       | -1.00                      | 3157.52                     | 10.87                      | 10.87                       | 14.50              | 0.17               | -0.00               | 29245.94            | 100.34             | 100.44              |
| 6                        | 100.51                     | 127.74                     | -0.00                      | 2647.41                     | 2.06                       | 2.18                        | -0.00              | -0.00              | 0.00                | -0.00               | -0.00              | -0.00               |

| POWER PERCENT RATED T.O. | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 51                       | 4.416          | 1664.320         | 0.259           | 2.873          | -0.000           | 3.352            |
| 73                       | 2.549          | 1674.996         | 0.022           | 4.202          | -0.000           | 4.483            |
| 91                       | 1.187          | 1772.493         | 0.010           | 6.111          | -0.000           | 6.111            |
| 6                        | -0.000         | -0.000           | -0.000          | -0.000         | 0.000            | -0.000           |

CAL ID NUMBER: 124 ENGINE TYPE AND MODEL: JT3D -3B  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 645735

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 161.292                   | 714.560               | 1.000              | 19.00                   | 51.076             | 226.28               | 225.722               | 285.00            | 0.17921            |
| TAKENOFF                           | 1.000               | 18000.0       | 18.161                    | 10271.152             | 1.000              | 0.70                    | 0.212              | 119.83               | 1.768                 | 210.00            | 0.00101            |
| CLIMBOUT                           | 0.850               | 15300.0       | 30.252                    | 8538.969              | 1.000              | 2.20                    | 1.109              | 313.10               | 3.543                 | 561.00            | 0.00198            |
| APPROACH                           | 0.400               | 7200.0        | 49.445                    | 3992.905              | 1.000              | 4.00                    | 3.296              | 266.19               | 12.383                | 480.00            | 0.00687            |
| TAXI-IDLE                          | 0.050               | 900.0         | 161.292                   | 714.560               | 1.000              | 7.00                    | 18.817             | 83.37                | 225.722               | 105.00            | 0.17921            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 74.511             | 1008.76              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 73.863             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 45.406             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.177              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 165.350                   | 714.560               | 1.000              | 19.00                   | 52.361             | 226.28               | 231.401               | 285.00            | 0.18372            |
| TAKENOFF                           | 1.000               | 18000.0       | 0.0                       | 10271.152             | 1.000              | 0.70                    | 0.0                | 119.83               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 15300.0       | 2.242                     | 8538.969              | 1.000              | 2.20                    | 0.082              | 313.10               | 0.263                 | 561.00            | 0.00015            |
| APPROACH                           | 0.400               | 7200.0        | 5.495                     | 3992.905              | 1.000              | 4.00                    | 0.366              | 266.19               | 1.376                 | 480.00            | 0.00076            |
| TAXI-IDLE                          | 0.050               | 900.0         | 165.350                   | 714.560               | 1.000              | 7.00                    | 19.291             | 83.37                | 231.401               | 105.00            | 0.18372            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 72.100             | 1008.76              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 71.474             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 43.937             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 1.221                     | 714.560               | 1.000              | 19.00                   | 0.387               | 226.28               | 1.709                 | 285.00            | 0.00136            |
| TAKENOFF                           | 1.000               | 18000.0       | 123.605                   | 10271.152             | 1.000              | 0.70                    | 1.442               | 119.83               | 12.034                | 210.00            | 0.00687            |
| CLIMBOUT                           | 0.850               | 15300.0       | 85.236                    | 8538.969              | 1.000              | 2.20                    | 3.125               | 313.10               | 9.982                 | 561.00            | 0.00557            |
| APPROACH                           | 0.400               | 7200.0        | 21.435                    | 3992.905              | 1.000              | 4.00                    | 1.429               | 266.19               | 5.368                 | 480.00            | 0.00298            |
| TAXI-IDLE                          | 0.050               | 900.0         | 1.221                     | 714.560               | 1.000              | 7.00                    | 0.142               | 83.37                | 1.709                 | 105.00            | 0.00136            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.526               | 1008.76              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.469               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.977               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 80.114              |                      |                       |                   |                    |

DATE: 7/ 1/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 125 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: 644691

RATED THRUST: 19000.

ENGINE TOTAL TIME: 12024. HRS

TIME SINCE MD1 SECTION OVERHAUL: 7510. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 15996. HRS  
N2 COMPRESSOR OVERHAUL: 13660. HRS  
COMBUSTION CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3032. HRS  
N1 TURBINE OVERHAUL: 7510. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 62.60 FINISH 61.52

ATMOSPHERIC PRESSURE: START 29.93 FINISH 30.30

INLET AIR HUMIDITY, LBS H2O/LR AIR: 0.0085

RELATIVE HUMIDITY: 69.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.

| CLOCK TIME | TEST MODE | POWER THPUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM N1 | ENGINE SPEED RPM N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|---------------------|---------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 1611.00    | 1/ 0      | 9369.00                  | 52                 | 5230.00             | 9009.00             | 5036.00                  | -0.00                   | -0.000000 | -0.00                               | 1.38                      | -0.00                        |
| 1616.00    | 2/ 1      | 13399.00                 | 74                 | 5424.00             | 9484.00             | 7281.00                  | -0.00                   | -0.000000 | -0.00                               | 1.61                      | -0.00                        |
| 1622.00    | 3/ 2      | 16492.00                 | 91                 | 6443.00             | 9849.00             | 9425.00                  | -0.00                   | -0.000000 | -0.00                               | 1.83                      | -0.00                        |
| 1702.00    | 4/ 3      | 985.00                   | 5                  | 2023.00             | 5812.00             | 1187.00                  | -0.00                   | -0.000000 | -0.00                               | 0.0                       | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 52                       | 707.00                     | 40.90                     | 8.50          | 2.50                 | 5.85           | 40.00         | -0.00           | 47.00           | -0.00     | -0.00 | -0.00        |
| 74                       | 811.40                     | 47.70                     | 45.00         | 2.52                 | 0.45           | 71.00         | -0.00           | 72.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 921.20                     | 54.20                     | 30.00         | 3.00                 | 0.42           | 104.00        | -0.00           | 104.00          | -0.00     | -0.00 | -0.00        |
| 5                        | 525.20                     | 30.80                     | 840.00        | 1.38                 | 1945.00        | 9.50          | -0.00           | 10.50           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 52                       | 0.68                      | 0.27                      | -0.00                      | 3194.06                    | 5.28                      | 6.20                       | 3.44              | 1.35              | -0.00              | 15883.93           | 26.57             | 31.22              |
| 74                       | 3.44                      | 0.02                      | -0.00                      | 3150.42                    | 6.93                      | 9.05                       | 25.07             | 0.14              | -0.00              | 22938.23           | 64.98             | 65.90              |
| 91                       | 2.01                      | 0.02                      | -0.00                      | 3152.64                    | 11.43                     | 11.43                      | 18.91             | 0.15              | -0.00              | 29714.11           | 107.69            | 107.69             |
| 5                        | 102.45                    | 124.75                    | -0.00                      | 2641.87                    | 1.90                      | 2.10                       | 121.49            | 152.82            | -0.00              | 3135.90            | 2.26              | 2.49               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 52                       | 0.367          | 1695.371         | 0.145           | 2.836          | -0.000           | 4.332            |
| 74                       | 1.973          | 1713.215         | 0.011           | 4.853          | -0.000           | 4.922            |
| 91                       | 1.147          | 1801.730         | 0.009           | 6.530          | -0.000           | 6.530            |
| 5                        | 123.336        | 3193.657         | 155.150         | 2.291          | -0.000           | 2.532            |

CAL ID NUMBER: 125 ENGINE TYPE AND MODEL: JT3D -38 SERIAL NUMBER: 644691  
TEST ORGANIZATION: UNITEO/EPA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 129.777                   | 663.377               | 1.000              | 19.00                   | 41.096             | 210.07               | 195.631               | 285.00            | 0.14420            |
| TAKEOFF   | 1.000               | 18000.0       | 7.140                     | 10008.262             | 1.000              | 0.70                    | 0.083              | 116.76               | 0.713                 | 210.00            | 0.00040            |
| CLIMBOUT  | 0.850               | 15300.0       | 21.271                    | 8568.125              | 1.000              | 2.20                    | 0.780              | 314.16               | 2.483                 | 561.00            | 0.00139            |
| APPROACH  | 0.400               | 7200.0        | 3.985                     | 3870.219              | 1.000              | 4.00                    | 0.266              | 258.01               | 1.030                 | 480.00            | 0.00055            |
| TAXI-IDLE | 0.050               | 900.0         | 129.777                   | 663.377               | 1.000              | 7.00                    | 15.141             | 77.39                | 195.631               | 105.00            | 0.14420            |

TOTAL FOR CYCLE: 57.366  
LBS POLLUTANT/1K LB FUEL/CYCLE: 58.752  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 34.958  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.463

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 230.501                   | 663.377               | 1.000              | 19.00                   | 72.992             | 210.07               | 347.467               | 285.00            | 0.25611            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 10008.262             | 1.000              | 0.70                    | 0.0                | 116.76               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 0.0                       | 8568.125              | 1.000              | 2.20                    | 0.0                | 314.16               | 0.0                   | 561.00            | 0.0                |
| APPROACH  | 0.400               | 7200.0        | 0.0                       | 3870.219              | 1.000              | 4.00                    | 0.0                | 258.01               | 0.0                   | 480.00            | 0.0                |
| TAXI-IDLE | 0.050               | 900.0         | 230.501                   | 663.377               | 1.000              | 7.00                    | 26.892             | 77.39                | 347.467               | 105.00            | 0.25611            |

TOTAL FOR CYCLE: 99.884  
LBS POLLUTANT/1K LB FUEL/CYCLE: 102.298  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 60.868  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 1.128                     | 663.377               | 1.000              | 19.00                   | 0.357               | 210.07               | 1.700                 | 285.00            | 0.00125            |
| TAKEOFF   | 1.000               | 18000.0       | 124.387                   | 10008.262             | 1.000              | 0.70                    | 1.451               | 116.76               | 12.428                | 210.00            | 0.00691            |
| CLIMBOUT  | 0.850               | 15300.0       | 89.156                    | 8568.125              | 1.000              | 2.20                    | 3.269               | 314.16               | 10.406                | 561.00            | 0.00583            |
| APPROACH  | 0.400               | 7200.0        | 18.789                    | 3870.219              | 1.000              | 4.00                    | 1.253               | 258.01               | 4.855                 | 480.00            | 0.00261            |
| TAXI-IDLE | 0.050               | 900.0         | 1.128                     | 663.377               | 1.000              | 7.00                    | 0.132               | 77.39                | 1.700                 | 105.00            | 0.00125            |

TOTAL FOR CYCLE: 6.462  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.618  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 3.938  
LBS POLLUTANT/1000K LB TH AT T.O.: 80.621

DATE: 7/ 6/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 128 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: 669507

RATED THRUST: 18000.

ENGINE TOTAL TIME: 8308. HRS

TIME SINCE HOT SECTION OVERHAUL: 8308. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8308. HRS  
N2 COMPRESSOR OVERHAUL: 14347. HRS  
COMBUSTOR CAN REPLACEMENT: 8308. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 8308. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 8308. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 64.40 FINISH 66.20

ATMOSPHERIC PRESSURE: START 29.82 FINISH 29.89

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0085

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1040.00    | 1/ 0      | 9275.00                  | 51                 | 5193.00          | 962.00                   | 9436.00                 | -0.00    | -0.000000                           | -0.00                     | 1.38                         |
| 1050.00    | 2/ 1      | 13100.00                 | 72                 | 5877.00          | 9535.00                  | 7091.00                 | -0.00    | -0.000000                           | -0.00                     | 1.60                         |
| 1055.00    | 3/ 2      | 16350.00                 | 90                 | 6409.00          | 9933.00                  | 9283.00                 | -0.00    | -0.000000                           | -0.00                     | 1.83                         |
| 1225.00    | 4/ 3      | 1050.00                  | 5                  | 2010.00          | 5796.00                  | 1192.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 51                       | 705.20                     | 40.80                     | 110.00        | 2.18                 | 9.00           | 33.00         | -0.00           | 39.00           | -0.00     | -0.00 | -0.00        |
| 72                       | 806.00                     | 47.10                     | 55.00         | 2.50                 | 1.50           | 54.00         | -0.00           | 58.00           | -0.00     | -0.00 | -0.00        |
| 90                       | 919.40                     | 53.70                     | 35.00         | 2.88                 | 1.20           | 80.00         | -0.00           | 84.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 536.00                     | 30.90                     | 560.00        | 1.42                 | 2130.00        | 4.00          | -0.00           | 4.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 51                       | 10.08                     | 0.47                      | -0.00                      | 3138.76                    | 4.97                      | 5.87                       | 95.11             | 4.46              | -0.00              | 29617.30           | 46.87             | 55.39              |
| 72                       | 4.41                      | 0.07                      | -0.00                      | 3148.77                    | 7.11                      | 7.64                       | 31.26             | 0.49              | -0.00              | 22327.94           | 50.42             | 54.15              |
| 90                       | 2.44                      | 0.05                      | -0.00                      | 3151.93                    | 9.15                      | 9.61                       | 22.63             | 0.44              | -0.00              | 29259.34           | 84.97             | 89.21              |
| 5                        | 66.60                     | 145.07                    | -0.00                      | 2653.26                    | 0.74                      | 0.78                       | 79.38             | 172.92            | -0.00              | 3162.69            | 0.93              | 0.93               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 51                       | 10.255         | 3193.240         | 0.481           | 5.053          | -0.000           | 5.977            |
| 72                       | 2.387          | 1704.423         | 0.037           | 3.849          | -0.000           | 4.134            |
| 90                       | 1.184          | 1799.563         | 0.027           | 5.197          | -0.000           | 5.457            |
| 5                        | 75.601         | 3012.087         | 1.64.690        | 0.887          | -0.000           | 0.887            |

CAL ID NUMBER: 128 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: 669507  
TEST ORGANIZATION: UNITED/EPA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 159.059                   | 1000.640              | 1.000              | 19.00                   | 50.369             | 316.87               | 158.958               | 285.00            | 0.17673            |
| TAKEOFF   | 1.000               | 18000.0       | 21.524                    | 9855.355              | 1.000              | 0.70                    | 0.251              | 114.98               | 2.184                 | 210.00            | 0.00120            |
| CLIMBOUT  | 0.850               | 15300.0       | 25.454                    | 8722.555              | 1.000              | 2.20                    | 0.933              | 319.83               | 2.918                 | 561.00            | 0.00166            |
| APPROACH  | 0.400               | 7200.0        | 53.969                    | 4295.113              | 1.000              | 4.00                    | 3.598              | 286.34               | 12.565                | 480.00            | 0.00750            |
| TAXI-IDLE | 0.050               | 900.0         | 159.059                   | 1000.640              | 1.000              | 7.00                    | 18.557             | 116.74               | 158.958               | 105.00            | 0.17673            |

TOTAL FOR CYCLE: 73.708 1154.76 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 63.830  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 44.917  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.395

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 220.641                   | 1000.640              | 1.000              | 19.00                   | 69.870             | 316.87               | 220.500               | 285.00            | 0.24516            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 9855.355              | 1.000              | 0.70                    | 0.0                | 114.98               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 0.0                       | 8722.555              | 1.000              | 2.20                    | 0.0                | 319.83               | 0.0                   | 561.00            | 0.0                |
| APPROACH  | 0.400               | 7200.0        | 7.604                     | 4295.113              | 1.000              | 4.00                    | 0.507              | 286.34               | 1.770                 | 480.00            | 0.00106            |
| TAXI-IDLE | 0.050               | 900.0         | 220.641                   | 1000.640              | 1.000              | 7.00                    | 25.741             | 116.74               | 220.500               | 105.00            | 0.24516            |

TOTAL FOR CYCLE: 96.118 1154.76 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 83.237  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 58.573  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 0.629                     | 1000.640              | 1.000              | 19.00                   | 0.199               | 316.87               | 0.629                 | 285.00            | 0.00070            |
| TAKEOFF   | 1.000               | 18000.0       | 104.940                   | 9855.355              | 1.000              | 0.70                    | 1.224               | 114.98               | 10.648                | 210.00            | 0.00583            |
| CLIMBOUT  | 0.850               | 15300.0       | 76.438                    | 8722.555              | 1.000              | 2.20                    | 2.803               | 319.83               | 8.763                 | 561.00            | 0.00500            |
| APPROACH  | 0.400               | 7200.0        | 20.175                    | 4295.113              | 1.000              | 4.00                    | 1.345               | 286.34               | 4.697                 | 480.00            | 0.00280            |
| TAXI-IDLE | 0.050               | 900.0         | 0.629                     | 1000.640              | 1.000              | 7.00                    | 0.073               | 116.74               | 0.629                 | 105.00            | 0.00070            |

TOTAL FOR CYCLE: 5.645 1154.76 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.888  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 3.440  
LBS POLLUTANT/1000K LB TH AT T.O.: 68.016

DATE: 07/07/71

TEST ORGANIZATION: UNITED/FPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 130 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: 669210  
 RATED THRUST: 18000.  
 ENGINE TOTAL TIME: 12660. HRS  
 TIME SINCE HOT SECTION OVERHAUL: -0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: -0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
 N1 TURBINE OVERHAUL: -0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS  
 FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 64.90 FINISH 59.70  
 ATMOSPHERIC PRESSURE: START 29.92 FINISH 30.00  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0068  
 RELATIVE HUMIDITY: 60.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 1600.00, FLOW RATE, LITERS/MIN: 1.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IS IN INCHES HG. WITH C1-2 FUEL ADDITIVE

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATIO T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-----------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 1702.00    | 1/ 2      | 8982.00            | 49                       | 5153.00 8820.00        | 5002.00                  | -0.00           | -0.000000 | -0.00                               | 1.36                      | -0.00                        |
| 1715.00    | 2/ 1      | 13202.00           | 73                       | 5901.00 9115.00        | 7382.00                  | -0.00           | -0.000000 | -0.00                               | 1.61                      | -0.00                        |
| 1719.00    | 3/ 2      | 16361.00           | 90                       | 6422.00 9665.00        | 9518.00                  | -0.00           | -0.000000 | -0.00                               | 1.83                      | -0.00                        |
| 1847.00    | 4/ 3      | 1085.00            | 6                        | 2093.00 5803.00        | 1409.00                  | -0.00           | -0.000000 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 49                       | 375.00                     | 40.50                     | 210.00        | 2.18                 | 12.00          | 34.00         | -0.00           | 37.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 435.00                     | 47.50                     | 85.00         | 2.60                 | 15.00          | 64.00         | -0.00           | 66.00           | -0.00     | -0.00 | -0.00        |
| 90                       | 490.00                     | 54.10                     | 50.00         | 3.02                 | 4.00           | 98.00         | -0.00           | 100.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 320.00                     | 30.90                     | 445.00        | 1.77                 | 1200.00        | 10.00         | -0.00           | 12.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FLOW CO LB/HR | MASS FLOW HC LB/HR | MASS FLOW NO2 LB/HR | MASS FLOW CO2 LB/HR | MASS FLOW NO LB/HR | MASS FLOW NOX LB/HR | MASS FLOW CO LB/HR | MASS FLOW HC LB/HR | MASS FLOW NO2 LB/HR | MASS FLOW CO2 LB/HR | MASS FLOW NO LB/HR | MASS FLOW NOX LB/HR |
|--------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| 49                       | 19.15              | 0.64               | -0.00               | 3124.03             | 5.09               | 5.54                | 95.60              | 3.21               | -0.00               | 15626.41            | 25.48              | 27.73               |
| 73                       | 6.54               | 0.66               | -0.00               | 3143.40             | 8.04               | 8.34                | 48.20              | 4.98               | -0.00               | 23207.52            | 59.72              | 61.59               |
| 90                       | 3.32               | 0.18               | -0.00               | 3150.17             | 10.69              | 10.90               | 31.59              | 1.74               | -0.00               | 29983.35            | 101.71             | 103.79              |
| 6                        | 90.91              | 69.74              | -0.00               | 2821.89             | 1.67               | 2.00                | 127.96             | 98.26              | -0.00               | 3976.03             | 2.35               | 2.82                |

| POWER PERCENT RATED T.O. | CO LB/HR | CO 2 LB/HR | THC LB/HR | NO LB/HR | NO 2 LB/HR | NO X LB/HR |
|--------------------------|----------|------------|-----------|----------|------------|------------|
| 49                       | 10.666   | 1739.748   | 0.358     | 2.837    | -0.000     | 3.087      |
| 73                       | 3.658    | 1757.879   | 0.370     | 4.524    | -0.000     | 4.665      |
| 90                       | 1.931    | 1832.612   | 0.106     | 6.217    | -0.000     | 6.344      |
| 6                        | 117.932  | 3664.551   | 90.560    | 2.164    | -0.000     | 2.597      |

FORM 8-72

FORM 8-72

CAL ID NUMBER: 130 ENGINE TYPE AND MODEL: JT3D -38 SERIAL NUMBER: 669210  
TEST ORGANIZATION: UNITED/EPA

| MODE                               | FRACTIONAL POWER | POWER # TH | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | CO MASS LBS. | FUEL MASS LBS. | LB CO / 1K LB FUEL | ENERGY # TH-HR | LB CO / # TH-HR |
|------------------------------------|------------------|------------|---------------------|-----------------|-----------------|-------------------|--------------|----------------|--------------------|----------------|-----------------|
| TAXI-IDLE                          | 0.050            | 900.0      | 103.946             | 1131.970        | 1.000           | 19.00             | 32.916       | 358.46         | 91.828             | 285.00         | 0.11550         |
| TAKEOFF                            | 1.000            | 18000.0    | 17.913              | 10741.891       | 1.000           | 0.70              | 0.209        | 125.32         | 1.668              | 210.00         | 0.00100         |
| CLIMBOUT                           | 0.850            | 15300.0    | 33.587              | 8841.145        | 1.000           | 2.20              | 1.232        | 324.18         | 3.799              | 561.00         | 0.00220         |
| APPROACH                           | 0.400            | 7200.0     | 114.785             | 4174.469        | 1.000           | 4.00              | 7.652        | 278.30         | 27.497             | 480.00         | 0.01594         |
| TAXI-IDLE                          | 0.050            | 900.0      | 103.946             | 1131.970        | 1.000           | 7.00              | 12.127       | 132.06         | 91.828             | 105.00         | 0.11550         |
| TOTAL FOR CYCLE:                   |                  |            |                     |                 |                 |                   | 54.136       | 1218.31        |                    | 1641.00        |                 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                  |            |                     |                 |                 |                   | 44.435       |                |                    |                |                 |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                  |            |                     |                 |                 |                   | 32.990       |                |                    |                |                 |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                  |            |                     |                 |                 |                   | 1.161        |                |                    |                |                 |

| MODE                               | FRACTIONAL POWER | POWER # TH | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | HC MASS LBS. | FUEL MASS LBS. | LB HC / 1K LB FUEL | ENERGY # TH-HR | LB HC / # TH-HR |
|------------------------------------|------------------|------------|---------------------|-----------------|-----------------|-------------------|--------------|----------------|--------------------|----------------|-----------------|
| TAXI-IDLE                          | 0.050            | 900.0      | 87.223              | 1131.970        | 1.000           | 19.00             | 27.621       | 358.46         | 77.054             | 285.00         | 0.09691         |
| TAKEOFF                            | 1.000            | 18000.0    | 0.0                 | 10741.891       | 1.000           | 0.70              | 0.0          | 125.32         | 0.0                | 210.00         | 0.0             |
| CLIMBOUT                           | 0.850            | 15300.0    | 2.260               | 8841.145        | 1.000           | 2.20              | 0.083        | 324.18         | 0.256              | 561.00         | 0.00015         |
| APPROACH                           | 0.400            | 7200.0     | 6.139               | 4174.469        | 1.000           | 4.00              | 0.409        | 278.30         | 1.471              | 480.00         | 0.00085         |
| TAXI-IDLE                          | 0.050            | 900.0      | 87.223              | 1131.970        | 1.000           | 7.00              | 10.176       | 132.06         | 77.054             | 105.00         | 0.09691         |
| TOTAL FOR CYCLE:                   |                  |            |                     |                 |                 |                   | 38.289       | 1218.31        |                    | 1641.00        |                 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                  |            |                     |                 |                 |                   | 31.428       |                |                    |                |                 |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                  |            |                     |                 |                 |                   | 23.333       |                |                    |                |                 |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                  |            |                     |                 |                 |                   | 0.0          |                |                    |                |                 |

| MODE                               | FRACTIONAL POWER | POWER # TH | EMISSION RATE LB/HR | FUEL RATE LB/HR | USAGE WT FACTOR | TIME IN MODE MIN. | NOX MASS LBS. | FUEL MASS LBS. | LB NOX/ 1K LB FUEL | ENERGY # TH-HR | LB NOX/ # TH-HR |
|------------------------------------|------------------|------------|---------------------|-----------------|-----------------|-------------------|---------------|----------------|--------------------|----------------|-----------------|
| TAXI-IDLE                          | 0.050            | 900.0      | 1.915               | 1131.970        | 1.000           | 19.00             | 0.606         | 358.46         | 1.692              | 285.00         | 0.00213         |
| TAKEOFF                            | 1.000            | 18000.0    | 133.762             | 10741.891       | 1.000           | 0.70              | 1.561         | 125.32         | 12.452             | 210.00         | 0.00743         |
| CLIMBOUT                           | 0.850            | 15300.0    | 89.157              | 8841.145        | 1.000           | 2.20              | 3.269         | 324.18         | 10.084             | 561.00         | 0.00583         |
| APPROACH                           | 0.400            | 7200.0     | 20.411              | 4174.469        | 1.000           | 4.00              | 1.361         | 278.30         | 4.890              | 480.00         | 0.00283         |
| TAXI-IDLE                          | 0.050            | 900.0      | 1.915               | 1131.970        | 1.000           | 7.00              | 0.223         | 132.06         | 1.692              | 105.00         | 0.00213         |
| TOTAL FOR CYCLE:                   |                  |            |                     |                 |                 |                   | 7.020         | 1218.31        |                    | 1641.00        |                 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                  |            |                     |                 |                 |                   | 5.762         |                |                    |                |                 |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                  |            |                     |                 |                 |                   | 4.278         |                |                    |                |                 |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                  |            |                     |                 |                 |                   | 86.698        |                |                    |                |                 |

DATE: 7/16/71

TEST ORGANIZATION: UNIT 33/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 133 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: 645064

MAXED THRUST: 18000.

ENGINE TOTAL TIME: 8016. HRS

TIME SINCE HOT SECTION OVERHAUL: 2992. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 2992. HRS  
N2 COMPRESSOR OVERHAUL: 12527. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 1285. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL W/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 55.22 FINISH 58.28

ATMOSPHERIC PRESSURE: START 29.79 FINISH 29.87

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0082

RELATIVE HUMIDITY: 88.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00 FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
PRE-REPAIR TYPE ENGINE.

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 930.00     | 1/ 0      | 4745.00            | 48                       | 5046.00          | 8846.00 | 4562.00 | -0.00                    | -0.000000               | -0.00    | 1.35                                | -0.00                     |                              |
| 842.00     | 2/ 1      | 13102.00           | 72                       | 5819.00          | 9359.00 | 6923.00 | -0.00                    | -0.000000               | -0.00    | 1.60                                | -0.00                     |                              |
| 867.00     | 3/ 2      | 14511.00           | 91                       | 6404.00          | 9779.00 | 9269.00 | -0.00                    | -0.000000               | -0.00    | 1.85                                | -0.00                     |                              |
| 946.00     | 4/ 3      | 1010.00            | 5                        | 2037.00          | 5961.00 | 1191.00 | -0.00                    | -0.000000               | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 48                       | 643.80                     | 40.00                     | 95.00         | 2.15                 | 10.50          | 32.00         | -0.00           | 43.00           | -0.00     | -0.00 | -0.00        |
| 72                       | 773.80                     | 47.10                     | 60.00         | 2.51                 | 1.80           | 68.00         | -0.00           | 62.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 883.40                     | 54.30                     | 42.00         | 3.10                 | 1.50           | 99.00         | -0.00           | 104.00          | -0.00     | -0.00 | -0.00        |
| 5                        | 519.80                     | 30.60                     | 995.00        | 1.51                 | 1200.00        | 9.60          | -0.00           | 10.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI H2O LB/1K LB FUEL | MASS EMI H2O2 LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|----------------------------|-----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 48                       | 8.83                      | 0.56                      | -0.00                      | 3140.48                    | 4.09                       | 6.57                        | 40.29             | 2.55              | -0.00              | 14326.86           | 22.29             | 29.95              |
| 72                       | 4.79                      | 0.08                      | -0.00                      | 3148.14                    | 8.92                       | 8.13                        | 13.16             | 0.57              | -0.00              | 21794.56           | 61.73             | 56.28              |
| 91                       | 2.77                      | 0.06                      | -0.00                      | 3151.47                    | 10.52                      | 11.05                       | 25.19             | 0.52              | -0.00              | 29210.94           | 97.52             | 102.45             |
| 5                        | 115.55                    | 79.82                     | -0.00                      | 2755.36                    | 1.83                       | 1.91                        | 137.63            | 95.06             | -0.00              | 3281.63            | 2.18              | 2.27               |

| POWER PERCENT RATED T.O. | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 48                       | 4.607          | 1438.297         | 0.297           | 2.549          | -0.000           | 3.475            |
| 72                       | 2.531          | 1663.453         | 0.043           | 4.711          | -0.000           | 4.295            |
| 91                       | 1.525          | 1769.142         | 0.031           | 5.906          | -0.000           | 6.205            |
| 5                        | 116.263        | 3249.141         | 94.120          | 2.159          | -0.000           | 2.249            |

CAL ID NUMBER: 133 ENGINE TYPE AND MODEL: JT3D -3B  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 645064

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 253.721                   | 971.948               | 1.000              | 19.00                   | 80.345             | 307.78               | 261.044               | 285.00            | 0.28191            |
| TAKEDOFF                           | 1.000               | 18000.0       | 18.876                    | 10223.277             | 1.000              | 0.70                    | 0.220              | 119.27               | 1.846                 | 210.00            | 0.00105            |
| CLIMBOUT                           | 0.850               | 15300.0       | 23.474                    | 8348.531              | 1.000              | 2.20                    | 0.861              | 306.11               | 2.812                 | 561.00            | 0.00153            |
| APPROACH                           | 0.400               | 7200.0        | 42.979                    | 3887.598              | 1.000              | 4.00                    | 2.865              | 259.17               | 11.055                | 480.00            | 0.00597            |
| TAXI-IDLE                          | 0.050               | 900.0         | 253.721                   | 971.948               | 1.000              | 7.00                    | 29.601             | 113.39               | 261.044               | 105.00            | 0.28191            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 113.892            | 1105.73              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 103.001            |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 69.404             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.223              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 95.306                    | 971.948               | 1.000              | 19.00                   | 30.180             | 307.78               | 98.057                | 285.00            | 0.10590            |
| TAKEDOFF                           | 1.000               | 18000.0       | 0.0                       | 10223.277             | 1.000              | 0.70                    | 0.0                | 119.27               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 15300.0       | 0.0                       | 8348.531              | 1.000              | 2.20                    | 0.0                | 306.11               | 0.0                   | 561.00            | 0.0                |
| APPROACH                           | 0.400               | 7200.0        | 3.649                     | 3887.598              | 1.000              | 4.00                    | 0.243              | 259.17               | 0.939                 | 480.00            | 0.00051            |
| TAXI-IDLE                          | 0.050               | 900.0         | 95.306                    | 971.948               | 1.000              | 7.00                    | 11.119             | 113.39               | 98.057                | 105.00            | 0.10590            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 41.543             | 1105.73              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 37.570             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 25.315             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 1.675                     | 971.948               | 1.000              | 19.00                   | 0.530               | 307.78               | 1.723                 | 285.00            | 0.00186            |
| TAKEDOFF                           | 1.000               | 18000.0       | 129.334                   | 10223.277             | 1.000              | 0.70                    | 1.509               | 119.27               | 12.651                | 210.00            | 0.00719            |
| CLIMBOUT                           | 0.850               | 15300.0       | 80.936                    | 8348.531              | 1.000              | 2.20                    | 2.968               | 306.11               | 9.695                 | 561.00            | 0.00529            |
| APPROACH                           | 0.400               | 7200.0        | 22.503                    | 3887.598              | 1.000              | 4.00                    | 1.500               | 259.17               | 5.788                 | 480.00            | 0.00313            |
| TAXI-IDLE                          | 0.050               | 900.0         | 1.675                     | 971.948               | 1.000              | 7.00                    | 0.195               | 113.39               | 1.723                 | 105.00            | 0.00186            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.702               | 1105.73              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.062               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.084               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 83.827              |                      |                       |                   |                    |

DATE: 7/24/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 136 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: 669303

RATED THRUST: 18000.

ENGINE TOTAL TIME: 9064. HRS

TIME SINCE HOT SECTION OVERHAUL: 1137. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 62.60 FINISH 59.00

ATMOSPHERIC PRESSURE: START 29.92 FINISH 29.92

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0103

RELATIVE HUMIDITY: 72.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS TEMPERATURE IN DEGREES C  
 EXHAUST GAS PRESSURE IN INCHES HG.

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS FLOW AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|--------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 8963.00                  | 49                 | 5116.00          | 8951.00 | 4038.00 | -0.00                    | -0.000000                | -0.00    | 1.36                                | -0.00                     |                              |
| -0.00      | 2/ 1      | 12815.00                 | 71                 | 5746.00          | 9417.00 | 6963.00 | -0.00                    | -0.000000                | -0.00    | 1.59                                | -0.00                     |                              |
| -0.00      | 3/ 2      | 16267.00                 | 90                 | 6361.00          | 9812.00 | 9772.00 | -0.00                    | -0.000000                | -0.00    | 1.83                                | -0.00                     |                              |
| -0.00      | 4/ 3      | 598.00                   | 5                  | 2034.00          | 5849.00 | 1208.00 | -0.00                    | -0.000000                | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 49                       | 375.00                     | 40.40                     | 110.00        | 2.30                 | 0.10           | 34.00         | -0.00           | 44.00           | -0.00     | -0.00 | -0.00        |
| 71                       | 428.00                     | 46.90                     | 60.00         | 2.35                 | 1.20           | 57.60         | -0.00           | 63.60           | -0.00     | -0.00 | -0.00        |
| 90                       | 486.00                     | 53.90                     | 40.00         | 2.65                 | 0.66           | 88.00         | -0.00           | 93.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 270.00                     | 30.80                     | 930.00        | 1.42                 | 1860.00        | 9.40          | -0.00           | 10.20           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 49                       | 9.56                      | 0.00                      | -0.00                      | 3140.85                    | 4.85                      | 6.28                       | 46.25             | 0.07              | -0.00              | 15195.45           | 23.48             | 30.37              |
| 71                       | 4.71                      | 0.05                      | -0.00                      | 3148.33                    | 7.43                      | 8.21                       | 12.83             | 0.38              | -0.00              | 21921.85           | 51.77             | 57.16              |
| 90                       | 3.03                      | 0.03                      | -0.00                      | 3151.05                    | 10.94                     | 11.56                      | 28.07             | 0.27              | -0.00              | 29216.57           | 101.43            | 107.19             |
| 5                        | 179.94                    | 125.94                    | -0.00                      | 2637.65                    | 1.83                      | 1.98                       | 142.81            | 152.13            | -0.00              | 3196.28            | 2.20              | 2.39               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 49                       | 5.160          | 1695.354         | 0.003           | 2.620          | -0.000           | 3.391            |
| 71                       | 2.562          | 1710.640         | 0.029           | 4.039          | -0.000           | 4.460            |
| 90                       | 1.725          | 1796.064         | 0.016           | 6.235          | -0.000           | 6.589            |
| 5                        | 133.079        | 3192.662         | 152.435         | 2.209          | -0.000           | 2.397            |

CAL ID NUMBER: 136 ENGINE TYPE AND MODEL: JT3D -3B  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 669303

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 124.306                   | 1133.015              | 1.000              | 19.00                   | 39.364             | 358.79               | 109.713               | 285.00            | 0.13812            |
| TAKEDOFF                           | 1.000               | 18000.0       | 21.156                    | 10517.309             | 1.000              | 0.70                    | 0.247              | 122.70               | 2.011                 | 210.00            | 0.00118            |
| CLIMBOUT                           | 0.850               | 15300.0       | 25.372                    | 8653.250              | 1.000              | 2.20                    | 0.930              | 317.29               | 2.932                 | 561.00            | 0.00166            |
| APPROACH                           | 0.400               | 7200.0        | 63.594                    | 4028.169              | 1.000              | 4.00                    | 4.240              | 268.54               | 15.787                | 480.00            | 0.00883            |
| TAXI-IDLE                          | 0.050               | 900.0         | 124.306                   | 1133.015              | 1.000              | 7.00                    | 14.502             | 132.18               | 109.713               | 105.00            | 0.13812            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 59.283             | 1199.50              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 49.423             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 36.126             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.371              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 145.806                   | 1133.015              | 1.000              | 19.00                   | 46.172             | 358.79               | 128.689               | 285.00            | 0.16201            |
| TAKEDOFF                           | 1.000               | 18000.0       | 0.0                       | 10517.309             | 1.000              | 0.70                    | 0.0                | 122.70               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 15300.0       | 0.0                       | 8653.250              | 1.000              | 2.20                    | 0.0                | 317.29               | 0.0                   | 561.00            | 0.0                |
| APPROACH                           | 0.400               | 7200.0        | 10.969                    | 4028.169              | 1.000              | 4.00                    | 0.731              | 268.54               | 2.723                 | 480.00            | 0.00152            |
| TAXI-IDLE                          | 0.050               | 900.0         | 145.806                   | 1133.015              | 1.000              | 7.00                    | 17.011             | 132.18               | 128.689               | 105.00            | 0.16201            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 63.914             | 1199.50              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 53.284             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 38.948             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 2.129                     | 1133.015              | 1.000              | 19.00                   | 0.674               | 358.79               | 1.879                 | 285.00            | 0.00237            |
| TAKEDOFF                           | 1.000               | 18000.0       | 144.115                   | 10517.309             | 1.000              | 0.70                    | 1.681               | 122.70               | 13.703                | 210.00            | 0.00801            |
| CLIMBOUT                           | 0.850               | 15300.0       | 91.373                    | 8653.250              | 1.000              | 2.20                    | 3.350               | 317.29               | 10.559                | 561.00            | 0.00597            |
| APPROACH                           | 0.400               | 7200.0        | 22.227                    | 4028.169              | 1.000              | 4.00                    | 1.482               | 268.54               | 5.518                 | 480.00            | 0.00309            |
| TAXI-IDLE                          | 0.050               | 900.0         | 2.129                     | 1133.015              | 1.000              | 7.00                    | 0.248               | 132.18               | 1.879                 | 105.00            | 0.00237            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.436               | 1199.50              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.199               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.531               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 93.408              |                      |                       |                   |                    |

DATE: 7/27/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 282 ENGINE TYPE AND MODEL: JT3D-3B SERIAL NUMBER: P6438498  
 RATED THRUST: 18000  
 ENGINE TOTAL TIME: 11564. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 1564. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 5936. HRS  
 N2 COMPRESSOR OVERHAUL: 5936. HRS  
 COMBUSTOR CAN REPLACEMENT: 5936. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 5936. HRS  
 N1 TURBINE OVERHAUL: 5936. HRS  
 N2 TURBINE OVERHAUL: 5936. HRS  
 FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 75.00  
 ATMOSPHERIC PRESSURE: START 28.98 FINISH 28.98  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0094  
 RELATIVE HUMIDITY: 49.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FIFTH RUN. NO2  
 DETERMINED BY SUBTRACTION.

| FLASPED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 6/ 0         | 9100.00                           | 50                       | 5440.00                | 9160.00                           | 5110.00                       | 0.011300    | -0.00                                        | 1.37                               | -0.00                                 |
| 4.30            | 1/ 6         | 11200.00                          | 62                       | 5860.00                | 9460.00                           | 6320.00                       | 0.012300    | -0.00                                        | -0.00                              | -0.00                                 |
| 13.00           | 2/ 1         | 13700.00                          | 73                       | 6280.00                | 9730.00                           | 7650.00                       | 0.013500    | -0.00                                        | -0.00                              | -0.00                                 |
| 28.00           | 3/ 2         | 15420.00                          | 85                       | 6680.00                | 10080.00                          | 9400.00                       | 0.015000    | -0.00                                        | -0.00                              | -0.00                                 |
| 34.00           | 4/ 3         | 1100.00                           | 6                        | 2160.00                | 6150.00                           | 1110.00                       | 0.008000    | -0.00                                        | -0.00                              | -0.00                                 |
| 36.30           | 5/ 4         | 14900.00                          | 82                       | 6560.00                | 9890.00                           | 8940.00                       | 0.014600    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SNOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 50                                | 739.00                              | 4.80                               | 43.00               | 2.09                          | 1.00                 | 36.00               | 2.00                     | 38.00                    | -0.00     | -0.00 | -0.00        |
| 62                                | 797.00                              | 6.50                               | 20.00               | 2.27                          | 12.00                | 47.00               | 2.00                     | 49.00                    | -0.00     | -0.00 | -0.00        |
| 73                                | 862.00                              | 9.50                               | 9.00                | 2.49                          | 3.00                 | 74.00               | 1.00                     | 75.00                    | -0.00     | -0.00 | -0.00        |
| 85                                | 961.00                              | 10.90                              | 8.00                | 2.77                          | 0.0                  | 91.00               | 0.0                      | 91.00                    | -0.00     | -0.00 | -0.00        |
| 6                                 | 554.00                              | 0.30                               | 649.00              | 1.44                          | 1025.00              | 2.00                | 7.00                     | 9.00                     | -0.00     | -0.00 | -0.00        |
| 82                                | 941.00                              | 10.20                              | 12.00               | 2.49                          | 20.00                | 80.00               | 1.00                     | 81.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 50                                | 4.09                               | 0.05                               | 0.31                                | 3126.66                             | 5.63                               | 5.94                                | 20.92                   | 0.28                    | 1.60                     | 15977.23                 | 28.77                   | 30.37                    |
| 62                                | 1.75                               | 0.60                               | 0.29                                | 3128.83                             | 6.77                               | 7.06                                | 11.09                   | 3.81                    | 1.82                     | 19774.20                 | 42.90                   | 44.62                    |
| 73                                | 0.72                               | 0.14                               | 0.13                                | 3131.73                             | 9.73                               | 9.86                                | 5.51                    | 1.04                    | 1.01                     | 23957.75                 | 74.43                   | 75.44                    |
| 85                                | 0.58                               | 0.0                                | 0.0                                 | 3132.34                             | 10.76                              | 10.76                               | 5.41                    | 0.0                     | 0.0                      | 29443.96                 | 101.12                  | 101.12                   |
| 6                                 | 80.51                              | 72.93                              | 1.44                                | 2806.94                             | 0.41                               | 1.83                                | 89.37                   | 80.84                   | 1.59                     | 3115.70                  | 0.45                    | 2.04                     |
| 82                                | 0.89                               | 0.85                               | 0.12                                | 3129.52                             | 9.73                               | 9.85                                | 7.94                    | 7.58                    | 1.09                     | 27977.97                 | 86.98                   | 88.07                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K*TH-HR | CO<br>2<br>LB/1K*TH-HR | THC<br>LB/1K*TH-HR | NO<br>LB/1K*TH-HR | NO<br>2<br>LB/1K*TH-HR | NO<br>X<br>LB/1K*TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 50                                | 2.292             | 1755.740               | 0.031              | 3.162             | 0.176                  | 3.337                  |
| 62                                | 0.990             | 1765.554               | 0.340              | 3.822             | 0.163                  | 3.984                  |
| 73                                | 0.418             | 1814.981               | 0.080              | 5.639             | 0.076                  | 5.715                  |
| 85                                | 0.351             | 1929.466               | 0.0                | 6.558             | 0.0                    | 6.558                  |
| 6                                 | 81.247            | 2832.453               | 73.490             | 0.411             | 1.430                  | 1.851                  |
| 82                                | 0.533             | 1877.710               | 0.509              | 5.838             | 0.073                  | 5.911                  |

CAL ID NUMBER: 282 ENGINE TYPE AND MODEL: JT3D -3B  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6438498

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 80.303                    | 907.073               | 1.000              | 19.00                   | 25.429             | 287.24               | 88.530                | 285.00            | 0.08923            |
| TAKEOFF   | 1.000               | 18000.0       | 3.952                     | 11810.000             | 1.000              | 0.70                    | 0.046              | 137.78               | 0.335                 | 210.00            | 0.00022            |
| CLIMBOUT  | 0.850               | 15300.0       | 9.337                     | 9419.023              | 1.000              | 2.20                    | 0.342              | 345.36               | 0.991                 | 561.00            | 0.00061            |
| APPROACH  | 0.400               | 7200.0        | 41.424                    | 4212.953              | 1.000              | 4.00                    | 2.762              | 280.86               | 9.832                 | 480.00            | 0.00575            |
| TAXI-IDLE | 0.050               | 900.0         | 80.303                    | 907.073               | 1.000              | 7.00                    | 9.369              | 105.83               | 88.530                | 105.00            | 0.08923            |

TOTAL FOR CYCLE: 37.948 1157.08 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 32.797  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 23.125  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.256

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 80.978                    | 907.073               | 1.000              | 19.00                   | 25.643             | 287.24               | 89.274                | 285.00            | 0.08998            |
| TAKEOFF   | 1.000               | 18000.0       | 1.771                     | 11810.000             | 1.000              | 0.70                    | 0.021              | 137.78               | 0.150                 | 210.00            | 0.00010            |
| CLIMBOUT  | 0.850               | 15300.0       | 2.459                     | 9419.023              | 1.000              | 2.20                    | 0.090              | 345.36               | 0.261                 | 561.00            | 0.00016            |
| APPROACH  | 0.400               | 7200.0        | 0.285                     | 4212.953              | 1.000              | 4.00                    | 0.019              | 280.86               | 0.068                 | 480.00            | 0.00004            |
| TAXI-IDLE | 0.050               | 900.0         | 80.978                    | 907.073               | 1.000              | 7.00                    | 9.447              | 105.83               | 89.274                | 105.00            | 0.08998            |

TOTAL FOR CYCLE: 35.220 1157.08 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 30.439  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 21.463  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.148

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 1.445                     | 907.073               | 1.000              | 19.00                   | 0.458               | 287.24               | 1.593                 | 285.00            | 0.00161            |
| TAKEOFF   | 1.000               | 18000.0       | 151.117                   | 11810.000             | 1.000              | 0.70                    | 1.763               | 137.78               | 12.796                | 210.00            | 0.00840            |
| CLIMBOUT  | 0.850               | 15300.0       | 100.314                   | 9419.023              | 1.000              | 2.20                    | 3.678               | 345.36               | 10.650                | 561.00            | 0.00656            |
| APPROACH  | 0.400               | 7200.0        | 19.344                    | 4212.953              | 1.000              | 4.00                    | 1.290               | 280.86               | 4.592                 | 480.00            | 0.00269            |
| TAXI-IDLE | 0.050               | 900.0         | 1.445                     | 907.073               | 1.000              | 7.00                    | 0.169               | 105.83               | 1.593                 | 105.00            | 0.00161            |

TOTAL FOR CYCLE: 7.357 1157.08 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.358  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.483  
LBS POLLUTANT/1000K LB TH AT T.O.: 97.946

DATE: 7/30/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMBER: 101 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: (TWA3130)  
 RATED THRUST: 18000.  
 ENGINE TOTAL TIME: 10673. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 3939. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 3939. HRS  
 N2 COMPRESSOR OVERHAUL: 3939. HRS  
 COMBUSTOR CAN REPLACEMENT: 3939. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3939. HRS  
 N1 TURBINE OVERHAUL: 3939. HRS  
 N2 TURBINE OVERHAUL: 3939. HRS  
 FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 61.00 FINISH 60.00  
 ATMOSPHERIC PRESSURE: START 29.09 FINISH 29.10  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0074  
 RELATIVE HUMIDITY: 65.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FIFTH RUN. NO2 DETERMINED BY SUBTRACTION.

| FLASED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|-------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0         | 6/ 0      | 8960.00                  | 49                 | 5330.00          | 9000.00                  | 4950.00                 | 127.40   | 0.010900                            | -0.00                     | 1.37                         |
| 5.00        | 1/ 6      | 10860.00                 | 60                 | 5800.00          | 9270.00                  | 6070.00                 | 143.00   | 0.011800                            | -0.00                     | -0.00                        |
| 15.00       | 2/ 1      | 13060.00                 | 72                 | 6110.00          | 9540.00                  | 7390.00                 | 158.50   | 0.013000                            | -0.00                     | -0.00                        |
| 32.00       | 3/ 2      | 15320.00                 | 85                 | 6580.00          | 9860.00                  | 9180.00                 | 175.00   | 0.014600                            | -0.00                     | -0.00                        |
| 35.30       | 4/ 3      | 1040.00                  | 5                  | 2050.00          | 5950.00                  | 960.00                  | 30.60    | 0.008700                            | -0.00                     | -0.00                        |
| 40.00       | 5/ 4      | 14440.00                 | 80                 | 6430.00          | 9650.00                  | 8670.00                 | 169.20   | 0.014200                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOx (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 49                       | 705.00                     | 4.80                      | 43.00         | 2.16                | 4.00           | 30.00         | 8.00           | 38.00          | -0.00     | -0.00 | -0.00        |
| 60                       | 752.00                     | 6.50                      | 18.00         | 2.34                | 0.0            | 41.00         | 6.00           | 49.00          | -0.00     | -0.00 | -0.00        |
| 72                       | 813.00                     | 8.40                      | 9.00          | 2.58                | 0.0            | 61.00         | 4.00           | 65.00          | -0.00     | -0.00 | -0.00        |
| 85                       | 901.00                     | 11.10                     | 5.00          | 2.88                | 0.0            | 89.00         | 4.00           | 93.00          | -0.00     | -0.00 | -0.00        |
| 5                        | 541.00                     | 0.40                      | 583.00        | 1.80                | 910.00         | 3.00          | 7.00           | 10.00          | -0.00     | -0.00 | -0.00        |
| 80                       | 864.00                     | 10.10                     | 6.00          | 2.90                | 0.0            | 76.00         | 5.00           | 81.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/IK LB FUEL | MASS FMI HC LB/IK LB FUEL | MASS FMI NO2 LB/IK LB FUEL | MASS FMI CO2 LB/IK LB FUEL | MASS FMI NO LB/IK LB FUEL | MASS FMI NO2 LB/IK LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOx LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 49                       | 3.46                      | 0.21                      | 1.21                       | 3126.44                    | 4.54                      | 5.75                       | 19.61             | 1.04              | 5.99               | 15475.88           | 22.47             | 28.46              |
| 60                       | 1.53                      | 0.0                       | 0.84                       | 3130.83                    | 6.01                      | 6.85                       | 9.30              | 0.0               | 5.09               | 19004.15           | 36.51             | 41.60              |
| 72                       | 0.70                      | 0.0                       | 0.51                       | 3132.15                    | 7.74                      | 8.25                       | 5.14              | 0.0               | 3.75               | 23146.57           | 57.21             | 60.96              |
| 85                       | 0.35                      | 0.0                       | 0.45                       | 3132.70                    | 10.12                     | 10.58                      | 3.19              | 0.0               | 4.18               | 28758.15           | 92.91             | 97.08              |
| 5                        | 59.64                     | 53.32                     | 1.14                       | 2893.26                    | 0.50                      | 1.68                       | 57.26             | 51.18             | 1.13               | 2777.53            | 0.48              | 1.61               |
| 80                       | 0.43                      | 0.0                       | 0.58                       | 3132.57                    | 8.89                      | 9.47                       | 1.70              | 0.0               | 5.07               | 27159.36           | 77.07             | 82.14              |

| POWER PERCENT RATED T.O. | CO LB/IK#TH-HR | CO2 LB/IK#TH-HR | THC LB/IK#TH-HR | NO LB/IK#TH-HR | NO2 LB/IK#TH-HR | NOx LB/IK#TH-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 49                       | 2.198          | 1727.219        | 0.117           | 2.508          | 0.669           | 3.177           |
| 60                       | 0.857          | 1747.927        | 0.0             | 3.362          | 0.469           | 3.831           |
| 72                       | 0.193          | 1772.326        | 0.0             | 4.381          | 0.287           | 4.668           |
| 85                       | 0.207          | 1877.164        | 0.0             | 6.064          | 0.273           | 6.337           |
| 5                        | 55.053         | 2670.706        | 49.216          | 0.465          | 1.086           | 1.551           |
| 80                       | 0.257          | 1880.842        | 0.0             | 5.337          | 0.351           | 5.688           |

CAL ID NUMBER: 301 ENGINE TYPE AND MODEL: JT3D -3B

SERIAL NUMBER: (TWA3130)

TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 46.291                    | 758.395               | 1.000              | 19.00                   | 14.659             | 240.16               | 61.038                | 285.00            | 0.05143            |
| TAKEOFF                            | 1.000               | 18000.0       | 7.433                     | 10680.215             | 1.000              | 0.70                    | 0.087              | 124.60               | 0.696                 | 210.00            | 0.00041            |
| CLIMBOUT                           | 0.850               | 15300.0       | 6.336                     | 9007.215              | 1.000              | 2.20                    | 0.232              | 330.26               | 0.703                 | 561.00            | 0.00041            |
| APPROACH                           | 0.400               | 7200.0        | 31.120                    | 4052.942              | 1.000              | 4.00                    | 2.075              | 270.20               | 7.678                 | 480.00            | 0.00432            |
| TAXI-IDLE                          | 0.050               | 900.0         | 46.291                    | 758.395               | 1.000              | 7.00                    | 5.401              | 88.48                | 61.038                | 105.00            | 0.05143            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 22.453             | 1053.70              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 21.309             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.683             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.482              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 45.653                    | 758.395               | 1.000              | 19.00                   | 14.457             | 240.16               | 60.197                | 285.00            | 0.05073            |
| TAKEOFF                            | 1.000               | 18000.0       | 1.074                     | 10680.215             | 1.000              | 0.70                    | 0.013              | 124.60               | 0.101                 | 210.00            | 0.00006            |
| CLIMBOUT                           | 0.850               | 15300.0       | 1.362                     | 9007.215              | 1.000              | 2.20                    | 0.050              | 330.26               | 0.151                 | 561.00            | 0.00009            |
| APPROACH                           | 0.400               | 7200.0        | 4.011                     | 4052.942              | 1.000              | 4.00                    | 0.267              | 270.20               | 0.990                 | 480.00            | 0.00056            |
| TAXI-IDLE                          | 0.050               | 900.0         | 45.653                    | 758.395               | 1.000              | 7.00                    | 5.326              | 88.48                | 60.197                | 105.00            | 0.05073            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 20.113             | 1053.70              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 19.088             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 12.256             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.696              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 0.912                     | 758.395               | 1.000              | 19.00                   | 0.289               | 240.16               | 1.202                 | 285.00            | 0.00101            |
| TAKEOFF                            | 1.000               | 18000.0       | 146.354                   | 10680.215             | 1.000              | 0.70                    | 1.707               | 124.60               | 13.703                | 210.00            | 0.00813            |
| CLIMBOUT                           | 0.850               | 15300.0       | 93.930                    | 9007.215              | 1.000              | 2.20                    | 3.444               | 330.26               | 10.428                | 561.00            | 0.00614            |
| APPROACH                           | 0.400               | 7200.0        | 19.268                    | 4052.942              | 1.000              | 4.00                    | 1.285               | 270.20               | 4.754                 | 480.00            | 0.00268            |
| TAXI-IDLE                          | 0.050               | 900.0         | 0.912                     | 758.395               | 1.000              | 7.00                    | 0.106               | 88.48                | 1.202                 | 105.00            | 0.00101            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.831               | 1053.70              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.483               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.163               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 94.859              |                      |                       |                   |                    |

DATE: 8/ 2/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMFR: 302 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: 643558

RATED THRUST: 18000.

ENGINE TOTAL TIME: 4158. HRS

TIME SINCE HOT SECTION OVERHAUL: 4158. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 4158. HRS  
N2 COMPRESSOR OVERHAUL: 4158. HRS  
COMBUSTOR CAN REPLACEMENT: 4158. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 4158. HRS  
N1 TURBINE OVERHAUL: 4158. HRS  
N2 TURBINE OVERHAUL: 4158. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 28.94 FINISH 28.94

INLET AIR HUMIDITY, LBS H2O/LA AIR: 0.0120

RELATIVE HUMIDITY: 68.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FIFTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SFC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 6/ 0         | 9040.00                           | 50                       | 5420.00 9130.00                 | 5030.00                           | 126.00                        | 0.011100    | -0.00                                        | 1.37                               | -0.00                                 |
| 4.15            | 1/ 6         | 11180.00                          | 62                       | 5840.00 9420.00                 | 6790.00                           | 142.30                        | 0.012300    | -0.00                                        | 1.50                               | -0.00                                 |
| 9.30            | 2/ 1         | 13300.00                          | 73                       | 6220.00 9680.00                 | 7630.00                           | 158.50                        | 0.013400    | -0.00                                        | 1.66                               | -0.00                                 |
| 14.45           | 3/ 2         | 15440.00                          | 85                       | 6670.00 9980.00                 | 9360.00                           | 173.90                        | 0.014900    | -0.00                                        | 1.84                               | -0.00                                 |
| 22.00           | 4/ 3         | 960.00                            | 5                        | 2030.00 5870.00                 | 1020.00                           | 32.00                         | 0.008900    | -0.00                                        | -0.00                              | -0.00                                 |
| 26.00           | 5/ 4         | 15000.00                          | 83                       | 6550.00 9900.00                 | 8950.00                           | 171.00                        | 0.014500    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>CAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 50                                | 730.00                              | 4.40                               | 52.00               | 2.71                          | 17.00                | 34.00               | 3.00                     | 37.00                    | -0.00     | -0.00 | -0.00        |
| 62                                | 790.00                              | 4.50                               | 26.00               | 2.44                          | 2.00                 | 45.00               | 5.00                     | 50.00                    | -0.00     | -0.00 | -0.00        |
| 73                                | 856.00                              | 4.60                               | 15.00               | 2.45                          | 0.0                  | 62.00               | 3.00                     | 65.00                    | -0.00     | -0.00 | -0.00        |
| 85                                | 959.00                              | 11.00                              | 25.00               | 2.89                          | 0.0                  | 85.00               | 2.00                     | 87.00                    | -0.00     | -0.00 | -0.00        |
| 5                                 | 536.00                              | 0.30                               | 645.00              | 1.80                          | 710.00               | 4.00                | 4.00                     | 8.00                     | -0.00     | -0.00 | -0.00        |
| 83                                | 930.00                              | 10.30                              | 70.00               | 2.81                          | 0.0                  | 76.00               | 3.00                     | 79.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 50                                | 4.68                               | 0.67                               | 0.44                                | 3124.19                             | 5.02                               | 5.47                                | 23.53                   | 3.11                    | 2.23                     | 15714.70                 | 75.27                   | 27.50                    |
| 62                                | 2.12                               | 0.09                               | 0.67                                | 3129.65                             | 6.03                               | 6.70                                | 13.35                   | 0.54                    | 4.22                     | 14685.50                 | 37.95                   | 47.17                    |
| 73                                | 1.13                               | 0.0                                | 1.37                                | 3131.47                             | 7.66                               | 8.03                                | 8.61                    | 0.0                     | 2.83                     | 23873.11                 | 58.44                   | 61.27                    |
| 85                                | 1.72                               | 0.0                                | 0.23                                | 3130.53                             | 9.63                               | 9.85                                | 16.13                   | 0.0                     | 2.12                     | 29301.78                 | 90.09                   | 97.21                    |
| 5                                 | 66.45                              | 41.90                              | 0.68                                | 2913.89                             | 0.68                               | 1.35                                | 67.78                   | 47.73                   | 0.69                     | 2972.17                  | 0.69                    | 1.38                     |
| 83                                | 1.42                               | 0.0                                | 0.35                                | 3131.01                             | 8.85                               | 9.20                                | 12.69                   | 0.0                     | 3.13                     | 28022.55                 | 79.23                   | 82.36                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 50                                | 2.003             | 1738.351               | 0.344              | 2.796             | 0.247                  | 3.042                  |
| 62                                | 1.194             | 1760.778               | 0.053              | 3.395             | 0.377                  | 3.772                  |
| 73                                | 0.647             | 1796.474               | 0.0                | 4.394             | 0.213                  | 4.606                  |
| 85                                | 1.045             | 1897.783               | 0.0                | 5.835             | 0.137                  | 5.972                  |
| 5                                 | 70.408            | 3990.007               | 44.514             | 0.719             | 0.719                  | 1.438                  |
| 83                                | 0.846             | 1808.170               | 0.0                | 5.282             | 0.209                  | 5.491                  |

CAL ID NUMBER: 302 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: 643558  
TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 52.797                    | 766.013               | 1.000              | 19.00                   | 16.719             | 242.57               | 68.924                | 285.00            | 0.05866            |
| TAKEOFF                            | 1.000               | 18000.0       | 17.397                    | 10620.641             | 1.000              | 0.70                    | 0.203              | 123.91               | 1.638                 | 210.00            | 0.00097            |
| CLIMBOUT                           | 0.850               | 15300.0       | 15.036                    | 9179.488              | 1.000              | 2.20                    | 0.551              | 336.58               | 1.638                 | 561.00            | 0.00098            |
| APPROACH                           | 0.400               | 7200.0        | 41.626                    | 4140.949              | 1.000              | 4.00                    | 2.775              | 276.06               | 10.052                | 480.00            | 0.00578            |
| TAXI-IDLE                          | 0.050               | 900.0         | 52.797                    | 766.013               | 1.000              | 7.00                    | 6.160              | 89.37                | 68.924                | 105.00            | 0.05866            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 26.408             | 1068.49              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 24.715             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 16.093             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.128              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 37.698                    | 766.013               | 1.000              | 19.00                   | 11.938             | 242.57               | 49.214                | 285.00            | 0.04189            |
| TAKEOFF                            | 1.000               | 18000.0       | 0.858                     | 10620.641             | 1.000              | 0.70                    | 0.010              | 123.91               | 0.081                 | 210.00            | 0.00005            |
| CLIMBOUT                           | 0.850               | 15300.0       | 1.449                     | 9179.488              | 1.000              | 2.20                    | 0.053              | 336.58               | 0.158                 | 561.00            | 0.00009            |
| APPROACH                           | 0.400               | 7200.0        | 4.860                     | 4140.949              | 1.000              | 4.00                    | 0.324              | 276.06               | 1.174                 | 480.00            | 0.00068            |
| TAXI-IDLE                          | 0.050               | 900.0         | 37.698                    | 766.013               | 1.000              | 7.00                    | 4.398              | 89.37                | 49.214                | 105.00            | 0.04189            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 16.723             | 1068.49              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.651             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 10.191             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.556              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 0.758                     | 766.013               | 1.000              | 19.00                   | 0.240               | 242.57               | 0.989                 | 285.00            | 0.00084            |
| TAKEOFF                            | 1.000               | 18000.0       | 132.511                   | 10620.641             | 1.000              | 0.70                    | 1.546               | 123.91               | 12.477                | 210.00            | 0.00736            |
| CLIMBOUT                           | 0.850               | 15300.0       | 87.860                    | 9179.488              | 1.000              | 2.20                    | 3.222               | 336.58               | 9.571                 | 561.00            | 0.00574            |
| APPROACH                           | 0.400               | 7200.0        | 18.624                    | 4140.949              | 1.000              | 4.00                    | 1.242               | 276.06               | 4.498                 | 480.00            | 0.00259            |
| TAXI-IDLE                          | 0.050               | 900.0         | 0.758                     | 766.013               | 1.000              | 7.00                    | 0.088               | 89.37                | 0.989                 | 105.00            | 0.00084            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.337               | 1068.49              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.931               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.862               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 85.887              |                      |                       |                   |                    |

DATE: 7/23/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 327 ENGINE TYPE AND MODFL: JT3D -3R SERIAL NUMREP: P-668815  
RATED THRUST: 18000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HNT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.70 FINISH 29.28

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0121

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00. FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GFN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE PATIU EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1042.00    | 1/ 0      | 850.00                   | 4                  | 0.0              | 5465.00                  | 915.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 1102.00    | 2/ 1      | 9675.00                  | 53                 | 5220.00          | 8995.00                  | 4765.00                 | 128.12   | 0.010080                            | -0.00                     | 1.34                         |
| 1120.00    | 3/ 2      | 11619.00                 | 64                 | 5580.00          | 4230.00                  | 5770.00                 | 142.67   | 0.010950                            | -0.00                     | 1.43                         |
| 1138.00    | 4/ 3      | 13758.00                 | 76                 | 5920.00          | 4455.00                  | 6810.00                 | 158.37   | 0.011680                            | -0.00                     | 1.55                         |
| 1153.00    | 5/ 4      | 15715.00                 | 87                 | 6260.00          | 9690.00                  | 8120.00                 | 160.59   | 0.013660                            | -0.00                     | 1.69                         |
| 1205.00    | 6/ 5      | 17731.00                 | 98                 | 6660.00          | 9980.00                  | 9700.00                 | 185.46   | 0.014140                            | -0.00                     | 1.83                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | -0.00                      | -0.00                     | 915.80        | 1.35                 | 1354.70        | 1.70          | 5.00            | 4.70            | 48.00     | 14.00 | -0.00        |
| 53                       | 700.00                     | 19.53                     | 56.30         | 2.05                 | 5.00           | 37.20         | 10.50           | 47.70           | -0.00     | 44.00 | -0.00        |
| 64                       | 750.00                     | 20.85                     | 36.00         | 2.21                 | 4.60           | 0.0           | 10.60           | 10.60           | -0.00     | 43.00 | -0.00        |
| 76                       | 900.00                     | 22.41                     | 24.40         | 2.39                 | 3.10           | 63.50         | 10.60           | 74.10           | -0.00     | 44.00 | 26.00        |
| 87                       | 1086.00                    | 24.34                     | 16.60         | 2.63                 | 2.70           | 83.40         | 6.30            | 89.70           | -0.00     | 44.00 | 26.00        |
| 98                       | 954.00                     | 26.37                     | 12.50         | 2.89                 | 14.60          | 0.0           | 4.70            | 4.70            | -0.00     | 41.00 | 24.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 115.97                    | 98.71                     | 1.04                       | 2686.07                    | 0.35                      | 1.39                       | 106.11            | 89.87             | 0.95               | 2457.77            | 0.32              | 1.28               |
| 53                       | 5.47                      | 0.28                      | 1.68                       | 3128.39                    | 5.93                      | 7.61                       | 26.06             | 1.33              | 7.98               | 14906.78           | 28.28             | 36.26              |
| 64                       | 3.25                      | 0.24                      | 1.57                       | 3131.99                    | 0.0                       | 1.57                       | 18.74             | 1.37              | 0.06               | 18071.59           | 0.0               | 9.06               |
| 76                       | 2.04                      | 0.15                      | 1.45                       | 3134.14                    | 8.71                      | 10.16                      | 13.91             | 1.01              | 9.92               | 21406.16           | 59.46             | 69.38              |
| 87                       | 1.26                      | 0.12                      | 0.79                       | 3134.44                    | 10.37                     | 11.18                      | 10.23             | 0.95              | 6.38               | 25459.77           | 94.40             | 90.78              |
| 98                       | 0.86                      | 0.58                      | 0.53                       | 3134.81                    | 0.0                       | 0.53                       | 9.37              | 5.60              | 5.17               | 30407.61           | 0.0               | 5.17               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 124.834        | 2891.492         | 105.725         | 0.381          | 1.120            | 1.500            |
| 53                       | 2.693          | 1540.757         | 0.117           | 2.923          | 0.825            | 3.748            |
| 64                       | 1.517          | 1555.348         | 0.118           | 0.0            | 0.780            | 0.780            |
| 76                       | 1.011          | 1555.906         | 0.074           | 4.322          | 0.721            | 5.043            |
| 87                       | 0.651          | 1670.095         | 0.061           | 5.371          | 0.406            | 5.776            |
| 98                       | 0.472          | 1714.942         | 0.316           | 0.0            | 0.292            | 0.292            |

CAL ID NUMBER: 327 ENGINE TYPE AND MODEL: JT3D -38  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-660015

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 84.190                    | 789.804               | 1.000              | 19.00                   | 26.660             | 250.10               | 106.596               | 285.00            | 0.09354            |
| TAKEOFF   | 1.000               | 18000.0       | 14.863                    | 9872.777              | 1.000              | 0.70                    | 0.173              | 115.18               | 1.505                 | 210.00            | 0.00083            |
| CLIMBOUT  | 0.850               | 15300.0       | 17.244                    | 7893.176              | 1.000              | 2.20                    | 0.632              | 289.42               | 2.185                 | 561.00            | 0.00113            |
| APPROACH  | 0.400               | 7200.0        | 39.779                    | 3703.266              | 1.000              | 4.00                    | 2.652              | 246.88               | 10.741                | 480.00            | 0.00552            |
| TAXI-IDLE | 0.050               | 900.0         | 84.190                    | 789.804               | 1.000              | 7.00                    | 9.822              | 92.14                | 106.596               | 105.00            | 0.09354            |

TOTAL FOR CYCLE: 39.940 993.73 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 40.192  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 24.339  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.963

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 62.389                    | 789.804               | 1.000              | 19.00                   | 19.757             | 250.10               | 78.993                | 285.00            | 0.06932            |
| TAKEOFF   | 1.000               | 18000.0       | 3.536                     | 9872.777              | 1.000              | 0.70                    | 0.041              | 115.18               | 0.358                 | 210.00            | 0.00020            |
| CLIMBOUT  | 0.850               | 15300.0       | 3.824                     | 7893.176              | 1.000              | 2.20                    | 0.140              | 289.42               | 0.484                 | 561.00            | 0.00025            |
| APPROACH  | 0.400               | 7200.0        | 6.168                     | 3703.266              | 1.000              | 4.00                    | 0.411              | 246.88               | 1.666                 | 480.00            | 0.00086            |
| TAXI-IDLE | 0.050               | 900.0         | 62.389                    | 789.804               | 1.000              | 7.00                    | 7.279              | 92.14                | 78.993                | 105.00            | 0.06932            |

TOTAL FOR CYCLE: 27.628 993.73 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 27.802  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 16.836  
LBS POLLUTANT/1000K LB TH AT T.O.: 2.292

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 0.846                     | 789.804               | 1.000              | 19.00                   | 0.268               | 250.10               | 1.071                 | 285.00            | 0.00094            |
| TAKEOFF   | 1.000               | 18000.0       | 134.745                   | 9872.777              | 1.000              | 0.70                    | 1.572               | 115.18               | 13.648                | 210.00            | 0.00749            |
| CLIMBOUT  | 0.850               | 15300.0       | 88.478                    | 7893.176              | 1.000              | 2.20                    | 3.244               | 289.42               | 11.209                | 561.00            | 0.00578            |
| APPROACH  | 0.400               | 7200.0        | 20.121                    | 3703.266              | 1.000              | 4.00                    | 1.341               | 246.88               | 5.433                 | 480.00            | 0.00279            |
| TAXI-IDLE | 0.050               | 900.0         | 0.846                     | 789.804               | 1.000              | 7.00                    | 0.099               | 92.14                | 1.071                 | 105.00            | 0.00094            |

TOTAL FOR CYCLE: 6.524 993.73 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.565  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 3.976  
LBS POLLUTANT/1000K LB TH AT T.O.: 87.334

DATE: 7/22/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 328 ENGINE TYPE AND MODEL: JT3D-3P SERIAL NUMBER: P669797

RATED THRUST: 18000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 30.00 FINISH 29.20

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0108

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

SMOKE DENSITY IS VGN BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHIP | PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS FLOW AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|---------------------------|--------------------|------------------------|--------------------------|--------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1640.00    | 1/ 0      | 860.00                    | 4                  | 1885.00                | 5550.00                  | 9.50                     | 32.52    | 0.007600                            | -0.00                     | 1.02                         |
| 1735.00    | 2/ 1      | 11625.00                  | 64                 | 5600.00                | 9210.00                  | 5770.00                  | 143.05   | 0.010910                            | -0.00                     | 1.44                         |
| 1800.00    | 3/ 2      | 13660.00                  | 75                 | 5960.00                | 9440.00                  | 6910.00                  | 159.98   | 0.011720                            | -0.00                     | 1.56                         |
| 1814.00    | 4/ 3      | 15672.00                  | 87                 | 6270.00                | 9640.00                  | 8050.00                  | 173.35   | 0.012610                            | -0.00                     | 1.69                         |
| 1825.00    | 5/ 4      | 17653.00                  | 98                 | 6690.00                | 9940.00                  | 9720.00                  | 186.25   | 0.014170                            | -0.00                     | 1.84                         |
| 1725.00    | 6/ 5      | 9400.00                   | 49                 | 5220.00                | 8980.00                  | 4715.00                  | 127.22   | 0.010030                            | -0.00                     | 1.34                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 555.00                     | 15.12                     | 887.10        | 1.32                 | 1241.20        | 4.80          | 0.0             | 4.80            | -0.00     | 14.00 | -0.00        |
| 64                       | 755.00                     | 20.89                     | 31.20         | 2.23                 | 4.10           | 51.10         | 6.60            | 57.70           | -0.00     | 39.00 | -0.00        |
| 75                       | 805.00                     | 22.59                     | 20.70         | 2.50                 | 4.00           | 67.70         | 6.20            | 73.90           | -0.00     | 43.00 | 26.00        |
| 87                       | 860.00                     | 24.30                     | 14.80         | 2.75                 | 3.50           | 84.50         | 5.30            | 89.80           | -0.00     | 40.00 | 22.00        |
| 98                       | 960.00                     | 26.50                     | 10.90         | 3.13                 | 3.40           | 118.50        | 4.30            | 122.80          | -0.00     | 36.00 | 20.00        |
| 49                       | 705.00                     | 19.47                     | 49.00         | 2.08                 | 6.20           | 39.70         | 6.50            | 46.20           | -0.00     | 37.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NH LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 115.57                    | 92.61                     | 0.0                        | 2702.08                    | 1.03                      | 1.03                       | 1.10              | 0.88              | 0.0                | 25.67              | 0.01              | 0.01               |
| 64                       | 2.79                      | 0.21                      | 0.97                       | 3132.79                    | 7.50                      | 8.47                       | 16.10             | 1.21              | 5.59               | 18076.18           | 43.30             | 48.69              |
| 75                       | 1.65                      | 0.18                      | 0.81                       | 3134.65                    | 8.87                      | 9.69                       | 11.41             | 1.26              | 5.62               | 21660.41           | 61.37             | 66.93              |
| 87                       | 1.77                      | 0.15                      | 0.63                       | 3135.66                    | 10.07                     | 10.70                      | 8.65              | 1.17              | 5.09               | 25242.04           | 81.09             | 86.17              |
| 98                       | 0.70                      | 0.12                      | 0.45                       | 3136.31                    | 12.41                     | 12.86                      | 6.76              | 1.21              | 4.38               | 30484.95           | 120.65            | 125.03             |
| 49                       | 4.78                      | 0.34                      | 1.02                       | 3129.30                    | 6.24                      | 7.27                       | 22.53             | 1.60              | 4.82               | 14754.66           | 29.44             | 34.26              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 1.277          | 29.848           | 1.023           | 0.011          | 0.0              | 0.011            |
| 64                       | 1.385          | 1554.940         | 0.104           | 1.725          | 0.481            | 4.206            |
| 75                       | 0.836          | 1585.681         | 0.092           | 4.489          | 0.411            | 4.900            |
| 87                       | 0.552          | 1610.646         | 0.075           | 5.174          | 0.375            | 5.498            |
| 98                       | 0.383          | 1726.900         | 0.068           | 6.835          | 0.248            | 7.083            |
| 49                       | 2.531          | 1657.828         | 0.180           | 3.908          | 0.542            | 3.849            |

CAL ID NUMBER: 328 ENGINE TYPE AND MODEL: JT3D -38  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P669797

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 22.788                    | 205.820               | 1.000              | 19.00                   | 7.216              | 65.18                | 110.716               | 285.00            | 0.02532            |
| TAKOFF    | 1.000               | 18000.0       | 9.379                     | 9927.949              | 1.000              | 0.70                    | 0.109              | 115.83               | 0.945                 | 210.00            | 0.00052            |
| CLIMBOUT  | 0.850               | 15300.0       | 12.702                    | 7946.180              | 1.000              | 2.20                    | 0.466              | 291.36               | 1.599                 | 561.00            | 0.00083            |
| APPROACH  | 0.400               | 7200.0        | 31.830                    | 3318.823              | 1.000              | 4.00                    | 2.122              | 221.25               | 9.591                 | 480.00            | 0.00442            |
| TAXI-IDLE | 0.050               | 900.0         | 22.788                    | 205.820               | 1.000              | 7.00                    | 2.659              | 24.01                | 110.716               | 105.00            | 0.02532            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 12.572  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 17.518  
LBS POLLUTANT/1000K LB TH AT T.O.: 7.661  
0.608

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 20.779                    | 205.820               | 1.000              | 19.00                   | 6.580              | 65.18                | 100.959               | 285.00            | 0.02309            |
| TAKOFF    | 1.000               | 18000.0       | 1.468                     | 9927.949              | 1.000              | 0.70                    | 0.017              | 115.83               | 0.148                 | 210.00            | 0.00008            |
| CLIMBOUT  | 0.850               | 15300.0       | 2.655                     | 7946.180              | 1.000              | 2.20                    | 0.097              | 291.36               | 0.334                 | 561.00            | 0.00017            |
| APPROACH  | 0.400               | 7200.0        | 6.408                     | 3318.823              | 1.000              | 4.00                    | 0.427              | 221.25               | 1.931                 | 480.00            | 0.00089            |
| TAXI-IDLE | 0.050               | 900.0         | 20.779                    | 205.820               | 1.000              | 7.00                    | 2.424              | 24.01                | 100.959               | 105.00            | 0.02309            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 9.546  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.302  
LBS POLLUTANT/1000K LB TH AT T.O.: 5.817  
0.952

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 0.589                     | 205.820               | 1.000              | 19.00                   | 0.186               | 65.18                | 2.860                 | 285.00            | 0.00065            |
| TAKOFF    | 1.000               | 18000.0       | 132.810                   | 9927.949              | 1.000              | 0.70                    | 1.549               | 115.83               | 13.377                | 210.00            | 0.00738            |
| CLIMBOUT  | 0.850               | 15300.0       | 86.100                    | 7946.180              | 1.000              | 2.20                    | 3.157               | 291.36               | 10.835                | 561.00            | 0.00563            |
| APPROACH  | 0.400               | 7200.0        | 20.685                    | 3318.823              | 1.000              | 4.00                    | 1.379               | 221.25               | 6.233                 | 480.00            | 0.00287            |
| TAXI-IDLE | 0.050               | 900.0         | 0.589                     | 205.820               | 1.000              | 7.00                    | 0.069               | 24.01                | 2.860                 | 105.00            | 0.00065            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.341  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.835  
LBS POLLUTANT/1000K LB TH AT T.O.: 3.864  
86.080

DATE: 7/21/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 329 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: P668817

RATED THRUST: 18000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 68.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 30.00 FINISH 29.20

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0090

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 925.00     | 1/ 0      | 850.00                   | 4                  | 1850.00          | 5440.00                  | 1080.00                 | 0.009110 | -0.00                               | 1.02                      | -0.00                        |
| 938.00     | 2/ 1      | 5535.00                  | 30                 | 4195.00          | 8260.00                  | 2875.00                 | 0.008390 | -0.00                               | 1.17                      | -0.00                        |
| 1020.00    | 3/ 2      | 880.00                   | 4                  | 1875.00          | 5535.00                  | 950.00                  | 0.007910 | -0.00                               | 1.02                      | -0.00                        |
| 1252.00    | 4/ 3      | 9659.00                  | 53                 | 5220.00          | 8995.00                  | 4745.00                 | 0.010170 | -0.00                               | 1.34                      | -0.00                        |
| 1315.00    | 5/ 4      | 11712.00                 | 65                 | 5610.00          | 9230.00                  | 5835.00                 | 0.011030 | -0.00                               | 1.45                      | -0.00                        |
| 1335.00    | 6/ 5      | 13724.00                 | 76                 | 5940.00          | 9450.00                  | 6885.00                 | 0.011770 | -0.00                               | 1.56                      | -0.00                        |
| 1348.00    | 7/ 6      | 15651.00                 | 86                 | 6250.00          | 9660.00                  | 8050.00                 | 0.012750 | -0.00                               | 1.68                      | -0.00                        |
| 1405.00    | 8/ 7      | 17653.00                 | 98                 | 6640.00          | 9980.00                  | 9820.00                 | 0.014320 | -0.00                               | 1.85                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 560.00                     | 15.11                     | 896.90        | 1.31                 | 1425.60        | 4.10          | 3.10            | 7.20            | -0.00     | 17.00 | -0.00        |
| 30                       | 610.00                     | 17.12                     | 143.80        | 1.66                 | 34.50          | 18.20         | 8.00            | 20.20           | -0.00     | 31.00 | -0.00        |
| 4                        | 540.00                     | 15.10                     | 864.40        | 1.35                 | 1293.80        | 3.60          | 5.60            | 9.20            | 38.00     | 15.00 | -0.00        |
| 53                       | 715.00                     | 19.46                     | 55.20         | 1.98                 | 4.40           | 36.60         | 9.30            | 45.90           | -0.00     | 40.00 | -0.00        |
| 65                       | 770.00                     | 20.77                     | 35.30         | 2.17                 | 1.90           | 47.50         | 9.10            | 56.60           | -0.00     | 42.00 | -0.00        |
| 76                       | 820.00                     | 22.53                     | 24.30         | 2.51                 | 1.40           | 61.50         | 11.30           | 72.80           | -0.00     | 42.00 | 24.00        |
| 86                       | 875.00                     | 24.14                     | 17.40         | 2.53                 | 2.10           | 80.30         | 9.30            | 89.60           | -0.00     | 42.00 | 24.00        |
| 98                       | 975.00                     | 26.54                     | 12.60         | 2.81                 | 4.70           | 118.70        | 10.10           | 129.80          | -0.00     | 39.00 | 22.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/FUEL | MASS FMI HC LB/FUEL | MASS FMI NO2 LB/FUEL | MASS FMI CO2 LB/FUEL | MASS FMI NO LB/FUEL | MASS FMI NOX LB/FUEL | MASS FMI CO LB/HP | MASS FMI HC LB/HP | MASS FMI NO2 LB/HP | MASS FMI CO2 LB/HP | MASS FMI NO LB/HP | MASS FMI NOX LB/HP |
|--------------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 116.14              | 105.72              | 0.66                 | 2655.23              | 0.87                | 1.53                 | 125.43            | 114.10            | 0.71               | 2874.45            | 0.94              | 1.65               |
| 30                       | 17.12               | 2.15                | 1.56                 | 3104.40              | 3.56                | 3.95                 | 49.21             | 6.76              | 4.50               | 8925.15            | 10.23             | 11.35              |
| 4                        | 110.29              | 96.50               | 1.17                 | 2705.20              | 0.75                | 1.93                 | 104.78            | 89.78             | 1.11               | 2569.74            | 0.72              | 1.83               |
| 53                       | 5.55                | 0.25                | 1.54                 | 3128.33              | 4.05                | 7.58                 | 26.34             | 1.20              | 7.29               | 14843.91           | 28.68             | 35.97              |
| 65                       | 3.24                | 0.10                | 1.37                 | 3132.38              | 7.17                | 8.54                 | 18.92             | 0.54              | 8.01               | 18277.41           | 41.82             | 49.64              |
| 76                       | 1.93                | 0.06                | 1.48                 | 3134.53              | 8.03                | 9.50                 | 13.30             | 0.44              | 10.16              | 21531.27           | 55.28             | 65.44              |
| 86                       | 1.37                | 0.09                | 1.20                 | 3135.33              | 10.40               | 11.61                | 11.05             | 0.76              | 9.70               | 25219.34           | 83.74             | 97.44              |
| 98                       | 0.99                | 0.19                | 1.18                 | 3135.81              | 13.85               | 15.03                | 8.79              | 1.88              | 11.57              | 30793.69           | 135.98            | 147.55             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 147.562        | 3396.408         | 134.330         | 1.108          | 0.838            | 1.946            |
| 30                       | 8.890          | 1617.694         | 1.722           | 1.848          | 0.812            | 2.051            |
| 4                        | 119.045        | 2920.183         | 102.019         | 0.814          | 1.266            | 2.081            |
| 53                       | 2.727          | 1536.796         | 0.124           | 2.970          | 0.755            | 3.724            |
| 65                       | 1.616          | 1560.571         | 0.050           | 3.571          | 0.684            | 4.255            |
| 76                       | 0.969          | 1572.520         | 0.032           | 4.029          | 0.740            | 4.768            |
| 86                       | 0.706          | 1612.637         | 0.049           | 5.351          | 0.520            | 5.970            |
| 98                       | 0.494          | 1744.390         | 0.106           | 7.703          | 0.655            | 8.359            |

CAL ID NUMBER: 329 ENGINE TYPE AND MODEL: JT3D -38  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P668817

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 80.545                    | 874.719               | 1.000              | 19.00                   | 25.506             | 276.99               | 92.081                | 285.00            | 0.08949            |
| TAKEOFF                            | 1.000               | 18000.0       | 14.233                    | 9995.387              | 1.000              | 0.70                    | 0.166              | 116.61               | 1.424                 | 210.00            | 0.00079            |
| CLIMBOUT                           | 0.850               | 15300.0       | 17.440                    | 7907.129              | 1.000              | 2.20                    | 0.639              | 289.93               | 2.206                 | 561.00            | 0.00114            |
| APPROACH                           | 0.400               | 7200.0        | 43.745                    | 3775.425              | 1.000              | 4.00                    | 2.916              | 251.69               | 11.587                | 480.00            | 0.00608            |
| TAXI-IDLE                          | 0.050               | 900.0         | 80.545                    | 874.719               | 1.000              | 7.00                    | 9.397              | 102.05               | 92.081                | 105.00            | 0.08949            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 38.624             | 1037.28              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 37.236             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 23.537             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.923              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 84.342                    | 874.719               | 1.000              | 19.00                   | 26.708             | 276.99               | 96.422                | 285.00            | 0.09371            |
| TAKEOFF                            | 1.000               | 18000.0       | 4.178                     | 9995.387              | 1.000              | 0.70                    | 0.049              | 116.61               | 0.418                 | 210.00            | 0.00023            |
| CLIMBOUT                           | 0.850               | 15300.0       | 3.305                     | 7907.129              | 1.000              | 2.20                    | 0.121              | 289.93               | 0.418                 | 561.00            | 0.00022            |
| APPROACH                           | 0.400               | 7200.0        | 6.730                     | 3775.425              | 1.000              | 4.00                    | 0.449              | 251.69               | 1.782                 | 480.00            | 0.00093            |
| TAXI-IDLE                          | 0.050               | 900.0         | 84.342                    | 874.719               | 1.000              | 7.00                    | 9.840              | 102.05               | 96.422                | 105.00            | 0.09371            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 37.167             | 1037.28              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 35.831             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 22.649             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.708              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 1.560                     | 874.719               | 1.000              | 19.00                   | 0.494               | 276.99               | 1.784                 | 285.00            | 0.00173            |
| TAKEOFF                            | 1.000               | 18000.0       | 159.271                   | 9995.387              | 1.000              | 0.70                    | 1.858               | 116.61               | 15.934                | 210.00            | 0.00885            |
| CLIMBOUT                           | 0.850               | 15300.0       | 91.570                    | 7907.129              | 1.000              | 2.20                    | 3.358               | 289.93               | 11.581                | 561.00            | 0.00598            |
| APPROACH                           | 0.400               | 7200.0        | 19.308                    | 3775.425              | 1.000              | 4.00                    | 1.287               | 251.69               | 5.114                 | 480.00            | 0.00268            |
| TAXI-IDLE                          | 0.050               | 900.0         | 1.560                     | 874.719               | 1.000              | 7.00                    | 0.182               | 102.05               | 1.784                 | 105.00            | 0.00173            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.179               | 1037.28              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.921               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.375               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 103.231             |                      |                       |                   |                    |

DATE: 8/ 5/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 331 ENGINE TYPE AND MODEL: JT3D -3B

SERIAL NUMBER: P643434B

RATED THRUST: 18000.

ENGINE TOTAL TIME: 16564. HRS

TIME SINCE HOT SECTION OVERHAUL: 16564. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 16564. HRS

N2 COMPRESSOR OVERHAUL: 16564. HRS

COMBUSTOR CAN REPLACEMENT: 7694. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 16564. HRS

N1 TURBINE OVERHAUL: 16564. HRS

N2 TURBINE OVERHAUL: 16564. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 1.722

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 29.14 FINISH 29.12

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0139

RELATIVE HUMIDITY: 63.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 9

COMMENTS:

NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATIO | PERCENT RATIO | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|---------------------|---------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 6/ 0      | 8820.00            | 48                  |               | 5460.00          | 9170.00                  | 5120.00                 | 124.40   | 0.011400                            | -0.00                     | -0.00                        |
| 4.00         | 1/ 6      | 11040.00           | 61                  |               | 5840.00          | 9410.00                  | 6320.00                 | 141.70   | 0.012400                            | -0.00                     | -0.00                        |
| 6.00         | 2/ 1      | 13310.00           | 73                  |               | 6250.00          | 9680.00                  | 7800.00                 | 158.90   | 0.013300                            | -0.00                     | -0.00                        |
| 10.00        | 3/ 2      | 15410.00           | 85                  |               | 6660.00          | 9970.00                  | 9490.00                 | 173.20   | 0.015200                            | -0.00                     | -0.00                        |
| 13.00        | 4/ 3      | 950.00             | 5                   |               | 2050.00          | 5870.00                  | 980.00                  | 30.60    | 0.008000                            | -0.00                     | -0.00                        |
| 14.00        | 5/ 4      | 15410.00           | 85                  |               | 6660.00          | 9910.00                  | 6540.00                 | 173.20   | 0.015300                            | -0.00                     | -0.00                        |
| 19.00        | 7/ 5      | 7040.00            | 39                  |               | 5000.00          | 8900.00                  | 4050.00                 | 110.00   | 0.010700                            | -0.00                     | -0.00                        |
| 22.00        | 9/ 1      | 5000.00            | 27                  |               | 4380.00          | 8480.00                  | 2980.00                 | 89.00    | 0.009100                            | -0.00                     | -0.00                        |
| 24.00        | 9/ 8      | 2950.00            | 16                  |               | 3490.00          | 7820.00                  | 1990.00                 | 63.20    | 0.008700                            | -0.00                     | -0.00                        |

| POWER PERCENT RATIO T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 48                       | 747.00                     | 5.00                      | 43.00         | 2.34                 | 50.00          | 35.00         | 4.00            | 39.00           | -0.00     | -0.00 | -0.00        |
| 61                       | 806.00                     | 6.50                      | 26.00         | 2.52                 | 38.00          | 48.00         | 2.00            | 50.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 874.00                     | 8.60                      | 19.00         | 2.70                 | 26.00          | 64.00         | 2.00            | 66.00           | -0.00     | -0.00 | -0.00        |
| 85                       | 957.00                     | 10.90                     | 34.00         | 2.98                 | 24.00          | 88.00         | 3.00            | 91.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 552.00                     | 0.30                      | 625.00        | 1.57                 | 1060.00        | 2.60          | 7.00            | 9.00            | -0.00     | -0.00 | -0.00        |
| 85                       | 964.00                     | 11.00                     | 25.00         | 3.04                 | 27.00          | 81.00         | 2.00            | 93.00           | -0.00     | -0.00 | -0.00        |
| 39                       | 687.00                     | 2.20                      | 65.00         | 2.10                 | 50.00          | 30.00         | 1.00            | 31.00           | -0.00     | -0.00 | -0.00        |
| 27                       | 639.00                     | 2.20                      | 92.00         | 1.91                 | 44.00          | 27.00         | 1.00            | 23.00           | -0.00     | -0.00 | -0.00        |
| 16                       | 594.00                     | 1.10                      | 242.00        | 1.79                 | 104.00         | 14.00         | 2.00            | 16.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATIO T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI V02 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 48                       | 3.73                      | 2.48                      | 0.57                       | 3189.04                    | 4.49                      | 5.56                       | 19.10             | 12.72             | 2.92               | 16127.87           | 25.53             | 28.45              |
| 61                       | 2.10                      | 1.76                      | 0.26                       | 3193.60                    | 6.36                      | 5.62                       | 13.25             | 11.09             | 1.67               | 20181.55           | 40.19             | 41.86              |
| 73                       | 1.43                      | 1.12                      | 0.25                       | 3196.38                    | 7.92                      | 8.17                       | 11.17             | 8.75              | 1.93               | 24931.79           | 61.78             | 63.71              |
| 85                       | 2.32                      | 0.94                      | 0.34                       | 3195.49                    | 4.86                      | 10.20                      | 22.02             | 8.90              | 3.19               | 39325.21           | 73.62             | 96.81              |
| 5                        | 73.26                     | 71.16                     | 1.35                       | 2891.39                    | 6.39                      | 1.73                       | 71.79             | 69.73             | 1.32               | 28331.56           | 0.38              | 1.70               |
| 85                       | 1.67                      | 1.03                      | 0.22                       | 3196.24                    | 8.00                      | 9.12                       | 10.94             | 6.77              | 1.44               | 20903.43           | 58.23             | 59.66              |
| 39                       | 6.27                      | 2.76                      | 0.16                       | 3184.27                    | 4.76                      | 4.91                       | 25.41             | 11.19             | 0.64               | 12896.31           | 19.26             | 19.90              |
| 27                       | 9.75                      | 2.67                      | 0.17                       | 3179.08                    | 3.83                      | 4.00                       | 24.04             | 7.96              | 0.52               | 9473.64            | 11.41             | 11.93              |
| 16                       | 27.93                     | 6.65                      | 0.37                       | 3141.00                    | 2.57                      | 2.94                       | 53.78             | 13.24             | 0.73               | 6250.58            | 5.11              | 5.84               |

| POWER PERCENT RATIO T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 48                       | 2.165          | 1851.233         | 1.442           | 2.895          | 0.331            | 3.225            |
| 61                       | 1.201          | 1829.220         | 1.705           | 3.440          | 0.152            | 3.792            |
| 73                       | 0.839          | 1873.162         | 0.857           | 4.662          | 0.145            | 4.797            |
| 85                       | 1.429          | 1967.892         | 0.578           | 6.075          | 0.207            | 6.282            |
| 5                        | 75.570         | 2982.698         | 73.405          | 0.397          | 1.390            | 1.787            |
| 85                       | 0.710          | 1354.485         | 0.434           | 3.778          | 0.093            | 3.872            |
| 39                       | 3.609          | 1831.862         | 1.590           | 2.736          | 0.091            | 2.827            |
| 27                       | 5.808          | 1894.729         | 1.591           | 2.281          | 0.104            | 2.385            |
| 16                       | 18.232         | 2118.942         | 4.497           | 1.737          | 0.247            | 1.990            |

CAL ID NUMBER: 331 ENGINE TYPE AND MODEL: JT3D -38  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6434348

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 62.882                    | 831.320               | 1.000              | 19.00                   | 19.913             | 263.25               | 75.642                | 285.00            | 0.06987            |
| TAKEOFF   | 1.000               | 18000.0       | 19.945                    | 11339.656             | 1.000              | 0.70                    | 0.233              | 132.30               | 1.759                 | 210.00            | 0.00111            |
| CLIMBOUT  | 0.850               | 15300.0       | 13.575                    | 9236.012              | 1.000              | 2.20                    | 0.498              | 338.65               | 1.470                 | 561.00            | 0.00089            |
| APPROACH  | 0.400               | 7200.0        | 25.659                    | 4184.395              | 1.000              | 4.00                    | 1.711              | 278.96               | 6.132                 | 480.00            | 0.00356            |
| TAXI-IDLE | 0.050               | 900.0         | 62.882                    | 831.320               | 1.000              | 7.00                    | 7.336              | 96.99                | 75.642                | 105.00            | 0.06987            |

TOTAL FOR CYCLE: 29.690 1110.15 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 26.744  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 18.093  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.293

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 61.345                    | 831.320               | 1.000              | 19.00                   | 19.426             | 263.25               | 73.793                | 285.00            | 0.06816            |
| TAKEOFF   | 1.000               | 18000.0       | 11.310                    | 11339.656             | 1.000              | 0.70                    | 0.132              | 132.30               | 0.997                 | 210.00            | 0.00063            |
| CLIMBOUT  | 0.850               | 15300.0       | 11.176                    | 9236.012              | 1.000              | 2.20                    | 0.410              | 338.65               | 1.210                 | 561.00            | 0.00073            |
| APPROACH  | 0.400               | 7200.0        | 14.401                    | 4184.395              | 1.000              | 4.00                    | 0.960              | 278.96               | 3.442                 | 480.00            | 0.00200            |
| TAXI-IDLE | 0.050               | 900.0         | 61.345                    | 831.320               | 1.000              | 7.00                    | 7.157              | 96.99                | 73.793                | 105.00            | 0.06816            |

TOTAL FOR CYCLE: 28.085 1110.15 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 25.298  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 17.114  
LBS POLLUTANT/1000K LB TH AT T.O.: 7.330

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 1.201                     | 831.320               | 1.000              | 19.00                   | 0.380               | 263.25               | 1.445                 | 285.00            | 0.00133            |
| TAKEOFF   | 1.000               | 18000.0       | 135.739                   | 11339.656             | 1.000              | 0.70                    | 1.584               | 132.30               | 11.970                | 210.00            | 0.00754            |
| CLIMBOUT  | 0.850               | 15300.0       | 86.023                    | 9236.012              | 1.000              | 2.20                    | 3.154               | 338.65               | 9.314                 | 561.00            | 0.00562            |
| APPROACH  | 0.400               | 7200.0        | 19.821                    | 4184.395              | 1.000              | 4.00                    | 1.321               | 278.96               | 4.737                 | 480.00            | 0.00275            |
| TAXI-IDLE | 0.050               | 900.0         | 1.201                     | 831.320               | 1.000              | 7.00                    | 0.140               | 96.99                | 1.445                 | 105.00            | 0.00133            |

TOTAL FOR CYCLE: 6.580 1110.15 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.927  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.010  
LBS POLLUTANT/1000K LB TH AT T.O.: 87.979

DATE: 8/ 4/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 337 ENGINE TYPE AND MODEL: JT3D -38

SERIAL NUMBER: 645361

RATED THRUST: 18000.

ENGINE TOTAL TIME: 12283. HRS

TIME SINCE HOT SECTION OVERHAUL: 1968. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 1968. HRS  
 N2 COMPRESSOR OVERHAUL: 1968. HRS  
 COMBUSTOR CAN REPLACEMENT: 1968. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 1968. HRS  
 N1 TURBINE OVERHAUL: 1968. HRS  
 N2 TURBINE OVERHAUL: 1968. HRS

FUEL: JET - A FUEL W/C RATIO: 1.470

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 90.00

ATMOSPHERIC PRESSURE: START 29.08 FINISH 29.08

INLET AIR HUMIDITY, LBS H2O/LH AIR: 0.0130

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 138.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

W/C CAL ESTIMATED  
 SAMPLE LINE TEMP. AVERAGE  
 PROBE CONFIG. AND LOCATION SAME AS USED FOR SPEY ON OR-02-71

| CLOCK TIME | TEST MODE | POWER THPUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM |         | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                          |                    | N1               | N2      |                          |                         |           |                                     |                           |                              |
| 600.00     | 4/ 0      | 920.00                   | 5                  | 2020.00          | 5790.00 | 1120.00                  | -0.00                   | -0.000000 | -0.00                               | 1.02                      | -0.00                        |
| 605.00     | 1/ 4      | 10850.00                 | 60                 | 5760.00          | 4360.00 | 6070.00                  | 157.00                  | -0.000000 | -0.00                               | 1.47                      | -0.00                        |
| 610.00     | 2/ 1      | 13450.00                 | 74                 | 6190.00          | 9660.00 | 7390.00                  | 175.00                  | -0.000000 | -0.00                               | 1.62                      | -0.00                        |
| 630.00     | 5/ 2      | 10600.00                 | 58                 | 5710.00          | 9320.00 | 5850.00                  | 155.00                  | -0.000000 | -0.00                               | 1.45                      | -0.00                        |
| 635.00     | 4/ 5      | 790.00                   | 4                  | 1840.00          | 5460.00 | 890.00                   | -0.00                   | -0.000000 | -0.00                               | 1.02                      | -0.00                        |
| 645.00     | 3/ 4      | 15800.00                 | 87                 | 3700.00          | 9970.00 | 4270.00                  | -0.00                   | -0.000000 | -0.00                               | 1.04                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO ? (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 60                       | 855.00                     | 20.26                     | 28.70         | 2.35                 | 6.30           | 46.80         | 17.00           | 63.80           | 0.62      | -0.00 | -0.00        |
| 74                       | 920.00                     | 22.27                     | 21.30         | 2.65                 | 6.70           | 42.20         | 18.00           | 60.20           | 0.51      | -0.00 | -0.00        |
| 58                       | 865.00                     | 20.07                     | 31.20         | 2.15                 | 6.00           | 45.10         | 23.00           | 68.10           | 0.39      | -0.00 | -0.00        |
| 4                        | 825.00                     | 14.63                     | 765.00        | 1.29                 | 1878.00        | 2.30          | 10.00           | 12.30           | 40.70     | -0.00 | -0.00        |
| 87                       | 1030.00                    | 25.07                     | 20.00         | 2.49                 | 8.20           | 101.20        | 24.50           | 125.70          | 0.46      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI N2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CU LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI N2 LB/HR |
|--------------------------|---------------------------|---------------------------|---------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|-------------------|
|                          |                           |                           |                           |                            |                           |                            |                   |                   |                    |                    |                   |                   |
| 60                       | 7.45                      | 0.31                      | 2.38                      | 3151.20                    | 6.56                      | 8.94                       | 14.75             | 1.85              | 14.35              | 18970.20           | 39.49             | 53.84             |
| 74                       | 1.51                      | 0.27                      | 2.24                      | 3152.61                    | 5.25                      | 7.49                       | 11.92             | 2.02              | 16.54              | 23297.76           | 18.78             | 55.31             |
| 58                       | 2.66                      | 0.29                      | 1.22                      | 3150.50                    | 6.32                      | 9.55                       | 15.58             | 1.77              | 18.86              | 18432.77           | 16.96             | 55.84             |
| 4                        | 98.86                     | 138.49                    | 2.12                      | 2619.25                    | 0.49                      | 2.61                       | 67.48             | 123.70            | 1.89               | 2331.13            | 0.43              | 2.32              |
| 87                       | 1.34                      | 0.32                      | 2.70                      | 3152.92                    | 11.16                     | 13.66                      | 12.44             | 2.92              | 25.04              | 29227.57           | 101.41            | 128.45            |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO ? LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                          |                |                  |                 |                |                  |                  |
| 60                       | 1.359          | 1748.405         | 0.171           | 3.640          | 1.322            | 4.962            |
| 74                       | 0.986          | 1732.175         | 0.150           | 2.884          | 1.230            | 4.114            |
| 58                       | 1.469          | 1738.941         | 0.162           | 3.489          | 1.774            | 5.269            |
| 4                        | 111.371        | 2450.800         | 156.586         | 0.550          | 2.391            | 2.941            |
| 87                       | 0.798          | 1849.843         | 0.185           | 6.545          | 1.585            | 8.110            |

CAL ID NUMBER: 337 ENGINE TYPE AND MODEL: JT3D -38  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 645361

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 102.025                   | 927.499               | 1.000              | 19.00                   | 32.308             | 293.71               | 110.000               | 285.00            | 0.11336            |
| TAKEOFF   | 1.000               | 18000.0       | 2.558                     | 10945.402             | 1.000              | 0.70                    | 0.030              | 127.70               | 0.234                 | 210.00            | 0.00014            |
| CLIMBOUT  | 0.850               | 15300.0       | 11.408                    | 9018.008              | 1.000              | 2.20                    | 0.418              | 330.66               | 1.265                 | 561.00            | 0.00075            |
| APPROACH  | 0.400               | 7200.0        | 46.814                    | 4275.543              | 1.000              | 4.00                    | 3.121              | 285.04               | 10.949                | 480.00            | 0.00650            |
| TAXI-IDLE | 0.050               | 900.0         | 102.025                   | 927.499               | 1.000              | 7.00                    | 11.903             | 108.21               | 110.000               | 105.00            | 0.11336            |

TOTAL FOR CYCLE: 47.780 1145.31 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 41.718  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 29.116  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.166

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 129.850                   | 927.499               | 1.000              | 19.00                   | 41.119             | 293.71               | 140.000               | 285.00            | 0.14428            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 10945.402             | 1.000              | 0.70                    | 0.0                | 127.70               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 0.0                       | 9018.008              | 1.000              | 2.20                    | 0.0                | 330.66               | 0.0                   | 561.00            | 0.0                |
| APPROACH  | 0.400               | 7200.0        | 18.501                    | 4275.543              | 1.000              | 4.00                    | 1.233              | 285.04               | 4.327                 | 480.00            | 0.00257            |
| TAXI-IDLE | 0.050               | 900.0         | 129.850                   | 927.499               | 1.000              | 7.00                    | 15.149             | 108.21               | 140.000               | 105.00            | 0.14428            |

TOTAL FOR CYCLE: 57.502 1145.31 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 50.206  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 35.041  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 2.003                     | 927.499               | 1.000              | 19.00                   | 0.634               | 293.71               | 2.160                 | 285.00            | 0.00223            |
| TAKEOFF   | 1.000               | 18000.0       | 167.596                   | 10945.402             | 1.000              | 0.70                    | 1.955               | 127.70               | 15.312                | 210.00            | 0.00931            |
| CLIMBOUT  | 0.850               | 15300.0       | 112.112                   | 9018.008              | 1.000              | 2.20                    | 4.111               | 330.66               | 12.432                | 561.00            | 0.00733            |
| APPROACH  | 0.400               | 7200.0        | 24.920                    | 4275.543              | 1.000              | 4.00                    | 1.661               | 285.04               | 5.829                 | 480.00            | 0.00346            |
| TAXI-IDLE | 0.050               | 900.0         | 2.003                     | 927.499               | 1.000              | 7.00                    | 0.234               | 108.21               | 2.160                 | 105.00            | 0.00223            |

TOTAL FOR CYCLE: 8.596 1145.31 1641.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.505  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.238  
LBS POLLUTANT/1000K LB TH AT T.O.: 108.627

DATE: 8/11/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 340 ENGINE TYPE AND MODEL: JT3D -38

SERIAL NUMBER: (TWA2537)

RATED THRUST: 18000.

ENGINE TOTAL TIME: 17359. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 17359. HRS  
 N2 COMPRESSOR OVERHAUL: 17359. HRS  
 COMBUSTOR CAN REPLACEMENT: 17359. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 17359. HRS  
 N1 TURBINE OVERHAUL: 17359. HRS  
 N2 TURBINE OVERHAUL: 17359. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 28.96 FINISH 28.96

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0137

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 12

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. MAINTENANCE DATA ARE NOT LOGICAL, BUT ARE  
 LISTED AS GIVEN BY TWA.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | N1       | N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|----------|----|-----------------------------------|-------------------------------|-------------|----------------------------------------------|-----------------------------|---------------------------------------|
| 0.0             | 6/ 0         | 8930.00                           | 49                       | 5470.00                | 9770.00  |    | 5100.00                           | 124.00                        | 0.011400    | -0.00                                        | 1.37                        | -0.00                                 |
| 7.00            | 1/ 6         | 10860.00                          | 60                       | 5850.00                | 9480.00  |    | 6310.00                           | 139.20                        | 0.012600    | -0.00                                        | 1.50                        | -0.00                                 |
| 16.00           | 2/ 1         | 13000.00                          | 72                       | 6230.00                | 9770.00  |    | 7590.00                           | 154.40                        | 0.013700    | -0.00                                        | 1.65                        | -0.00                                 |
| 47.00           | 3/ 2         | 15280.00                          | 84                       | 6670.00                | 10040.00 |    | 9440.00                           | 171.30                        | 0.015300    | -0.00                                        | 1.84                        | -0.00                                 |
| 52.00           | 4/ 3         | 880.00                            | 4                        | 1740.00                | 5790.00  |    | 900.00                            | 29.40                         | 0.008500    | -0.00                                        | -0.00                       | -0.00                                 |
| 57.00           | 7/ 4         | 1240.00                           | 6                        | 2330.00                | 6420.00  |    | 1200.00                           | 36.00                         | 0.009300    | -0.00                                        | -0.00                       | -0.00                                 |
| 59.30           | 8/ 7         | 1500.00                           | 8                        | 2550.00                | 6770.00  |    | 1340.00                           | 47.70                         | 0.009100    | -0.00                                        | -0.00                       | -0.00                                 |
| 62.00           | 4/ 8         | 1750.00                           | 9                        | 2750.00                | 7070.00  |    | 1470.00                           | 44.50                         | 0.009200    | -0.00                                        | -0.00                       | -0.00                                 |
| 64.00           | 10/ 4        | 2000.00                           | 11                       | 2920.00                | 7000.00  |    | 1590.00                           | 48.30                         | 0.009100    | -0.00                                        | -0.00                       | -0.00                                 |
| 67.00           | 11/10        | 2500.00                           | 13                       | 3220.00                | 7680.00  |    | 1840.00                           | 55.90                         | 0.009100    | -0.00                                        | -0.00                       | -0.00                                 |
| 69.30           | 12/11        | 4000.00                           | 22                       | 3980.00                | 8210.00  |    | 2470.00                           | 72.00                         | 0.009500    | -0.00                                        | -0.00                       | -0.00                                 |
| 74.00           | 13/12        | 7000.00                           | 38                       | 5020.00                | 8920.00  |    | 4090.00                           | 108.90                        | 0.010400    | -0.00                                        | -0.00                       | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 49                                | 765.00                              | 4.80                               | 40.00               | 2.30                          | 90.00                | 42.00               | 1.00                     | 43.00                    | -0.00     | -0.00 | -0.00        |
| 60                                | 835.00                              | 6.40                               | 28.30               | 2.54                          | 54.00                | 52.00               | 1.00                     | 53.00                    | -0.00     | -0.00 | -0.00        |
| 72                                | 883.00                              | 8.40                               | 20.00               | 2.75                          | 16.00                | 66.00               | 3.00                     | 69.00                    | -0.00     | -0.00 | -0.00        |
| 84                                | 997.00                              | 10.90                              | 25.00               | 3.07                          | 14.00                | 91.00               | 3.00                     | 94.00                    | -0.00     | -0.00 | -0.00        |
| 4                                 | 577.00                              | 0.30                               | 743.00              | 1.73                          | 942.00               | 3.00                | 6.00                     | 9.00                     | -0.00     | -0.00 | -0.00        |
| 6                                 | 574.00                              | 0.40                               | 642.00              | 1.88                          | 688.00               | 6.00                | 4.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 8                                 | 583.00                              | 0.50                               | 566.00              | 1.85                          | 562.00               | 7.00                | 3.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 9                                 | 590.00                              | 0.60                               | 527.00              | 1.87                          | 496.00               | 7.00                | 4.00                     | 11.00                    | -0.00     | -0.00 | -0.00        |
| 11                                | 599.00                              | 0.60                               | 452.00              | 1.82                          | 360.00               | 9.00                | 3.00                     | 12.00                    | -0.00     | -0.00 | -0.00        |
| 13                                | 617.00                              | 0.90                               | 360.00              | 1.83                          | 256.00               | 10.00               | 4.00                     | 14.00                    | -0.00     | -0.00 | -0.00        |
| 22                                | 622.00                              | 1.60                               | 162.00              | 1.94                          | 92.00                | 14.00               | 6.00                     | 19.00                    | -0.00     | -0.00 | -0.00        |
| 38                                | 700.00                              | 3.50                               | 64.00               | 2.11                          | 56.00                | 30.00               | 2.00                     | 32.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/IK<br>LB FUEL | MASS EMI<br>HC<br>LB/IK<br>LB FUEL | MASS EMI<br>NO2<br>LB/IK<br>LB FUEL | MASS EMI<br>CO2<br>LB/IK<br>LB FUEL | MASS EMI<br>NO<br>LB/IK<br>LB FUEL | MASS EMI<br>NOX<br>LB/IK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 49                                | 3.45                               | 4.44                               | 0.14                                | 3115.63                             | 5.95                               | 6.09                                | 17.59                   | 22.66                   | 0.72                     | 15889.71                 | 30.33                   | 31.06                    |
| 60                                | 2.19                               | 2.42                               | 0.13                                | 3123.16                             | 6.68                               | 6.81                                | 13.83                   | 15.27                   | 0.81                     | 19707.12                 | 42.18                   | 42.99                    |
| 72                                | 1.45                               | 0.66                               | 0.36                                | 3129.15                             | 7.85                               | 8.21                                | 10.99                   | 5.04                    | 2.71                     | 23750.21                 | 59.59                   | 62.30                    |
| 84                                | 1.62                               | 0.52                               | 0.32                                | 3129.27                             | 9.70                               | 10.07                               | 15.31                   | 4.91                    | 3.02                     | 29540.26                 | 91.54                   | 94.56                    |
| 4                                 | 77.84                              | 59.52                              | 1.03                                | 2847.65                             | 0.52                               | 1.55                                | 70.05                   | 53.57                   | 0.93                     | 2562.99                  | 0.46                    | 1.39                     |
| 6                                 | 63.60                              | 79.03                              | 0.65                                | 2926.23                             | 0.98                               | 1.63                                | 76.32                   | 46.84                   | 0.78                     | 3511.47                  | 1.17                    | 1.95                     |
| 8                                 | 57.50                              | 32.70                              | 0.50                                | 2953.18                             | 1.17                               | 1.67                                | 77.05                   | 43.82                   | 0.67                     | 3957.26                  | 1.57                    | 2.24                     |
| 9                                 | 53.28                              | 28.72                              | 0.66                                | 2970.73                             | 1.16                               | 1.83                                | 78.33                   | 42.22                   | 0.98                     | 4366.96                  | 1.71                    | 2.69                     |
| 11                                | 47.41                              | 21.63                              | 0.52                                | 2999.42                             | 1.55                               | 2.07                                | 75.38                   | 34.39                   | 0.82                     | 4769.07                  | 2.47                    | 3.29                     |
| 13                                | 37.95                              | 15.46                              | 0.69                                | 3031.21                             | 1.71                               | 2.42                                | 65.83                   | 28.44                   | 1.27                     | 5577.42                  | 3.19                    | 4.46                     |
| 22                                | 16.44                              | 5.35                               | 1.00                                | 3092.75                             | 2.33                               | 3.17                                | 40.60                   | 13.20                   | 2.47                     | 7639.09                  | 5.76                    | 7.82                     |
| 38                                | 6.20                               | 3.01                               | 0.31                                | 3115.23                             | 4.63                               | 4.94                                | 25.17                   | 12.33                   | 1.26                     | 12741.29                 | 18.94                   | 20.20                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/IK#TH-HR | CO<br>2<br>LB/IK#TH-HR | THC<br>LB/IK#TH-HR | NO<br>LB/IK#TH-HR | NO<br>2<br>LB/IK#TH-HR | NO<br>X<br>LB/IK#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 49                                | 1.970             | 1777.363               | 2.538              | 3.397             | 0.081                  | 3.478                  |
| 60                                | 1.273             | 1814.652               | 1.406              | 3.884             | 0.075                  | 3.958                  |
| 72                                | 0.946             | 1826.919               | 0.397              | 4.584             | 0.208                  | 4.792                  |
| 84                                | 1.002             | 1913.263               | 0.321              | 5.991             | 0.197                  | 6.188                  |
| 4                                 | 79.607            | 2912.373               | 60.872             | 0.528             | 1.056                  | 1.584                  |
| 6                                 | 61.547            | 2831.831               | 37.775             | 0.945             | 0.630                  | 1.575                  |
| 8                                 | 51.370            | 2638.173               | 29.213             | 1.044             | 0.447                  | 1.491                  |
| 9                                 | 44.758            | 2495.410               | 24.126             | 0.977             | 0.558                  | 1.535                  |
| 11                                | 37.691            | 2384.538               | 17.193             | 1.233             | 0.411                  | 1.644                  |
| 13                                | 27.932            | 2230.968               | 11.376             | 1.274             | 0.510                  | 1.784                  |
| 22                                | 10.150            | 1909.772               | 3.301              | 1.441             | 0.617                  | 1.955                  |
| 38                                | 7.624             | 1820.184               | 1.761              | 2.705             | 0.180                  | 2.886                  |

CAL ID NUMBER: 340 ENGINE TYPE AND MODEL: JT30 -38 SERIAL NUMBER: (TWA2537)  
TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 71.805                    | 842.784               | 1.000              | 19.00                   | 22.738             | 266.88               | 85.200                | 285.00            | 0.07978            |
| TAKEOFF                            | 1.000               | 18000.0       | 18.151                    | 11409.559             | 1.000              | 0.70                    | 0.212              | 133.11               | 1.591                 | 210.00            | 0.00101            |
| CLIMBOUT                           | 0.850               | 15300.0       | 16.321                    | 9444.996              | 1.000              | 2.20                    | 0.598              | 346.32               | 1.728                 | 561.00            | 0.00107            |
| APPROACH                           | 0.400               | 7200.0        | 32.603                    | 4547.926              | 1.000              | 4.00                    | 2.174              | 303.19               | 7.169                 | 480.00            | 0.00453            |
| TAXI-IDLE                          | 0.050               | 900.0         | 71.805                    | 842.784               | 1.000              | 7.00                    | 8.377              | 98.32                | 85.200                | 105.00            | 0.07978            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 34.099             | 1147.83              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 29.708             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 20.780             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.176              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 50.567                    | 842.784               | 1.000              | 19.00                   | 16.013             | 266.88               | 60.000                | 285.00            | 0.05619            |
| TAKEOFF                            | 1.000               | 18000.0       | 3.828                     | 11409.559             | 1.000              | 0.70                    | 0.045              | 133.11               | 0.335                 | 210.00            | 0.00021            |
| CLIMBOUT                           | 0.850               | 15300.0       | 11.212                    | 9444.996              | 1.000              | 2.20                    | 0.411              | 346.32               | 1.187                 | 561.00            | 0.00073            |
| APPROACH                           | 0.400               | 7200.0        | 16.660                    | 4547.926              | 1.000              | 4.00                    | 1.111              | 303.19               | 3.663                 | 480.00            | 0.00231            |
| TAXI-IDLE                          | 0.050               | 900.0         | 50.567                    | 842.784               | 1.000              | 7.00                    | 5.899              | 98.32                | 60.000                | 105.00            | 0.05619            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 23.479             | 1147.83              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 20.455             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 14.308             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.481              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 900.0         | 1.259                     | 842.784               | 1.000              | 19.00                   | 0.399               | 266.88               | 1.493                 | 285.00            | 0.00140            |
| TAKEOFF                            | 1.000               | 18000.0       | 146.407                   | 11409.559             | 1.000              | 0.70                    | 1.708               | 133.11               | 12.832                | 210.00            | 0.00813            |
| CLIMBOUT                           | 0.850               | 15300.0       | 95.080                    | 9444.996              | 1.000              | 2.20                    | 3.486               | 346.32               | 10.067                | 561.00            | 0.00621            |
| APPROACH                           | 0.400               | 7200.0        | 24.118                    | 4547.926              | 1.000              | 4.00                    | 1.608               | 303.19               | 5.303                 | 480.00            | 0.00335            |
| TAXI-IDLE                          | 0.050               | 900.0         | 1.259                     | 842.784               | 1.000              | 7.00                    | 0.147               | 98.32                | 1.493                 | 105.00            | 0.00140            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.348               | 1147.83              |                       | 1641.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.401               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.478               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 94.894              |                      |                       |                   |                    |

DATE: 8/19/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 358 ENGINE TYPE AND MODEL: JT3D-38 SERIAL NUMBER: P-668820

RATED THRUST: 18000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE MNT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL W/C RATIO: 2.00

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.75 FINISH 29.15

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0133

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 7

COMMENTS:

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1208.00    | 1/ 0      | 5000.00                  | 27                 | 4155.00          | 8245.00 | 2736.00 | 91.41                    | 0.008310                | -0.00    | 1.16                                | -0.00                     |                              |
| 1029.00    | 2/ 1      | 840.00                   | 4                  | 1855.00          | 5480.00 | 938.00  | 29.11                    | 0.008950                | -0.00    | 1.02                                | -0.00                     |                              |
| 1259.00    | 3/ 2      | 8900.00                  | 49                 | 5215.00          | 8960.00 | 4574.00 | 127.46                   | 0.009970                | -0.00    | 1.34                                | -0.00                     |                              |
| 1104.00    | 4/ 3      | 10800.00                 | 59                 | 5600.00          | 9160.00 | 5606.00 | 143.97                   | 0.010820                | -0.00    | 1.45                                | -0.00                     |                              |
| 1320.00    | 5/ 4      | 12750.00                 | 70                 | 5970.00          | 9420.00 | 6747.00 | 160.04                   | 0.011710                | -0.00    | 1.57                                | -0.00                     |                              |
| 1131.00    | 6/ 5      | 14600.00                 | 81                 | 6290.00          | 9650.00 | 7882.00 | 173.42                   | 0.012630                | -0.00    | 1.69                                | -0.00                     |                              |
| 1140.00    | 7/ 6      | 16400.00                 | 91                 | 6690.00          | 9930.00 | 9397.00 | 185.74                   | 0.014150                | -0.00    | 1.84                                | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 27                       | 610.00                     | 17.00                     | 155.70        | 1.80                 | 19.20          | 18.40         | 13.40           | 31.80           | -0.00     | -0.00 | -0.00        |
| 4                        | 555.00                     | 15.07                     | 908.60        | 1.27                 | 512.20         | 4.60          | 4.90            | 9.50            | -0.00     | -0.00 | -0.00        |
| 49                       | 700.00                     | 19.44                     | 60.10         | 2.19                 | 3.50           | 36.30         | 3.20            | 39.50           | -0.00     | -0.00 | -0.00        |
| 59                       | 750.00                     | 20.91                     | 38.80         | 2.21                 | 1.90           | 40.80         | 2.90            | 43.70           | -0.00     | -0.00 | -0.00        |
| 70                       | 805.00                     | 22.57                     | 20.70         | 2.32                 | 0.20           | 60.10         | 0.40            | 60.50           | -0.00     | -0.00 | -0.00        |
| 81                       | 865.00                     | 24.33                     | 17.40         | 2.75                 | 3.80           | 73.70         | 1.40            | 75.10           | -0.00     | -0.00 | -0.00        |
| 91                       | 955.00                     | 26.38                     | 9.10          | 2.85                 | 3.20           | 112.10        | 0.60            | 112.70          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 27                       | 17.11             | 1.21              | 2.42               | 3107.55            | 3.32              | 5.74               | 46.81             | 3.31              | 6.62               | 8502.25            | 9.09              | 15.70              |
| 4                        | 128.32            | 43.05             | 1.14               | 2818.04            | 1.07              | 2.70               | 120.36            | 40.38             | 1.07               | 2643.32            | 1.00              | 2.07               |
| 49                       | 5.46              | 0.18              | 0.48               | 3128.66            | 5.42              | 5.90               | 24.99             | 0.83              | 2.19               | 14310.48           | 24.80             | 26.98              |
| 59                       | 3.50              | 0.10              | 0.43               | 3131.98            | 6.04              | 6.47               | 19.62             | 0.55              | 2.41               | 17557.86           | 33.89             | 36.29              |
| 70                       | 1.78              | 0.01              | 0.06               | 3134.92            | 8.49              | 8.55               | 12.01             | 0.07              | 0.38               | 21151.31           | 57.28             | 57.66              |
| 81                       | 1.26              | 0.16              | 0.17               | 3135.33            | 8.78              | 8.95               | 9.95              | 1.24              | 1.37               | 24712.65           | 69.24             | 70.55              |
| 91                       | 0.64              | 0.13              | 0.07               | 3136.39            | 12.90             | 12.47              | 5.99              | 1.21              | 0.65               | 29472.67           | 121.19            | 121.84             |

| POWER PERCENT RATED T.O. | CO LB/IK#TH-HR | CO 2 LB/IK#TH-HR | THC LB/IK#TH-HR | NO LB/IK#TH-HR | NO 2 LB/IK#TH-HR | NO X LB/IK#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 27                       | 9.361          | 1700.451         | 0.661           | 1.817          | 1.323            | 3.141            |
| 4                        | 143.295        | 3146.814         | 48.067          | 1.192          | 1.269            | 2.461            |
| 49                       | 2.408          | 1607.910         | 0.094           | 2.786          | 0.246            | 3.032            |
| 59                       | 1.817          | 1625.728         | 0.051           | 3.138          | 0.223            | 3.361            |
| 70                       | 0.947          | 1659.927         | 0.005           | 4.493          | 0.030            | 4.522            |
| 81                       | 0.682          | 1692.647         | 0.085           | 4.742          | 0.090            | 4.832            |
| 91                       | 0.365          | 1797.115         | 0.074           | 7.390          | 0.040            | 7.429            |

CAL ID NUMBER: 358 ENGINE TYPE AND MODEL: JT3D -38  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-668820

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 119.588                   | 1040.707              | 1.000              | 19.00                   | 37.869             | 329.56               | 114.910               | 285.00            | 0.13288            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 10583.215             | 1.000              | 0.70                    | 0.0                | 123.47               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 8.851                     | 8846.027              | 1.000              | 2.20                    | 0.325              | 324.35               | 1.001                 | 561.00            | 0.00058            |
| APPROACH  | 0.400               | 7200.0        | 30.697                    | 3699.899              | 1.000              | 4.00                    | 2.046              | 246.66               | 8.297                 | 480.00            | 0.00426            |
| TAXI-IDLE | 0.050               | 900.0         | 119.588                   | 1040.707              | 1.000              | 7.00                    | 13.952             | 121.42               | 114.910               | 105.00            | 0.13288            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 54.192  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 47.311  
LBS POLLUTANT/1000K LB TH AT T.O.: 33.024  
0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 40.454                    | 1040.707              | 1.000              | 19.00                   | 12.810             | 329.56               | 38.871                | 285.00            | 0.04495            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 10583.215             | 1.000              | 0.70                    | 0.0                | 123.47               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 0.0                       | 8846.027              | 1.000              | 2.20                    | 0.0                | 324.35               | 0.0                   | 561.00            | 0.0                |
| APPROACH  | 0.400               | 7200.0        | 1.746                     | 3699.899              | 1.000              | 4.00                    | 0.116              | 246.66               | 0.472                 | 480.00            | 0.00024            |
| TAXI-IDLE | 0.050               | 900.0         | 40.454                    | 1040.707              | 1.000              | 7.00                    | 4.720              | 121.42               | 38.871                | 105.00            | 0.04495            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 17.646  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 15.405  
LBS POLLUTANT/1000K LB TH AT T.O.: 10.753  
0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 2.288                     | 1040.707              | 1.000              | 19.00                   | 0.724               | 329.56               | 2.198                 | 285.00            | 0.00254            |
| TAKEOFF   | 1.000               | 18000.0       | 159.101                   | 10583.215             | 1.000              | 0.70                    | 1.856               | 123.47               | 15.033                | 210.00            | 0.00884            |
| CLIMBOUT  | 0.850               | 15300.0       | 98.363                    | 8846.027              | 1.000              | 2.20                    | 3.607               | 324.35               | 11.119                | 561.00            | 0.00643            |
| APPROACH  | 0.400               | 7200.0        | 19.018                    | 3699.899              | 1.000              | 4.00                    | 1.268               | 246.66               | 5.140                 | 480.00            | 0.00264            |
| TAXI-IDLE | 0.050               | 900.0         | 2.288                     | 1040.707              | 1.000              | 7.00                    | 0.267               | 121.42               | 2.198                 | 105.00            | 0.00254            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.722  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.741  
LBS POLLUTANT/1000K LB TH AT T.O.: 4.706  
103.121

DATE: 8/20/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 359 ENGINE TYPE AND MODEL: JT3D -38 SERIAL NUMBER: P-668822

RATED THRUST: 18000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.55 FINISH 28.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0145

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 7

COMMENTS:

B/N BURNER CONFIGURATION SMOKE DENSITY IS VCN BRAN MEASURE

| CLOCK TIME | TEST MODE | POWER THRUST, LBS UR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1000.00    | 1/ 0      | 5020.00                  | 27                 | 4180.00 8225.00        | 2772.00                  | 91.78                   | 0.008390 | -0.00                               | 1.17                      | -0.00                        |
| 1229.00    | 2/ 1      | 8400.00                  | 4                  | 1840.00 5480.00        | 951.00                   | 32.29                   | 0.008190 | -0.00                               | 1.02                      | -0.00                        |
| 1100.00    | 3/ 2      | 8770.00                  | 48                 | 5205.00 8950.00        | 4526.00                  | 125.48                  | 0.010020 | -0.00                               | 1.33                      | -0.00                        |
| 1120.00    | 4/ 3      | 10720.00                 | 59                 | 5610.00 9180.00        | 5612.00                  | 147.91                  | 0.010540 | -0.00                               | 1.48                      | -0.00                        |
| 1323.00    | 5/ 4      | 12600.00                 | 69                 | 5970.00 9420.00        | 6703.00                  | 157.80                  | 0.011800 | -0.00                               | 1.56                      | -0.00                        |
| 1133.00    | 6/ 5      | 14500.00                 | 80                 | 6300.00 9655.00        | 7912.00                  | 171.07                  | 0.012850 | -0.00                               | 1.69                      | -0.00                        |
| 1153.00    | 7/ 6      | 17492.00                 | 97                 | 6730.00 9925.00        | 9499.00                  | 183.86                  | 0.013450 | -0.00                               | 1.85                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 27                       | 620.00                     | 16.96                     | 149.20        | 1.59                 | 19.10          | 17.60         | 8.50            | 26.10           | -0.00     | 27.00 | -0.00        |
| 4                        | 550.00                     | 15.00                     | 908.50        | 1.37                 | 244.90         | 5.30          | 1.50            | 6.80            | -0.00     | 10.00 | -0.00        |
| 48                       | 705.00                     | 19.25                     | 60.40         | 1.82                 | 8.10           | 35.00         | 0.70            | 35.70           | -0.00     | 36.00 | -0.00        |
| 59                       | 765.00                     | 21.25                     | 37.00         | 2.20                 | 2.90           | 50.50         | 6.40            | 56.90           | -0.00     | 37.00 | -0.00        |
| 69                       | 815.00                     | 22.37                     | 21.00         | 2.70                 | 2.10           | 59.30         | 5.80            | 65.10           | -0.00     | 38.00 | -0.00        |
| 80                       | 895.00                     | 24.18                     | 17.40         | 2.93                 | 5.40           | 76.90         | 5.50            | 82.40           | -0.00     | 36.00 | -0.00        |
| 97                       | 980.00                     | 26.33                     | 13.60         | 3.33                 | 5.80           | 109.50        | 5.10            | 114.60          | -0.00     | 36.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 27                       | 18.54                     | 1.36                      | 1.74                       | 3104.88                    | 3.59                      | 5.33                       | 51.40             | 3.77              | 4.81               | 8604.73            | 9.96              | 14.77              |
| 4                        | 122.15                    | 18.86                     | 0.33                       | 2894.09                    | 1.17                      | 1.50                       | 116.16            | 17.93             | 0.32               | 2752.28            | 1.11              | 1.43               |
| 48                       | 6.60                      | 0.51                      | 0.13                       | 3125.98                    | 6.28                      | 6.41                       | 29.88             | 2.30              | 0.57               | 14148.18           | 28.44             | 29.01              |
| 59                       | 3.35                      | 0.15                      | 0.95                       | 3132.06                    | 7.52                      | 8.47                       | 18.81             | 0.84              | 5.35               | 17577.14           | 42.18             | 47.52              |
| 69                       | 1.55                      | 0.09                      | 0.70                       | 3135.06                    | 7.20                      | 7.90                       | 10.40             | 0.60              | 4.72               | 21014.31           | 48.25             | 52.97              |
| 80                       | 1.19                      | 0.21                      | 0.62                       | 3115.30                    | 8.60                      | 9.22                       | 5.38              | 1.67              | 4.87               | 24806.52           | 68.06             | 72.93              |
| 97                       | 0.82                      | 0.20                      | 0.50                       | 3135.92                    | 10.78                     | 11.28                      | 7.74              | 1.89              | 4.77               | 29788.07           | 102.40            | 107.17             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 27                       | 10.239         | 1714.447         | 0.751           | 1.984          | 0.958            | 2.942            |
| 4                        | 138.286        | 3276.527         | 21.350          | 1.325          | 0.375            | 1.700            |
| 48                       | 3.407          | 1613.248         | 0.262           | 3.243          | 0.065            | 1.308            |
| 59                       | 1.755          | 1639.659         | 0.079           | 3.935          | 0.499            | 4.433            |
| 69                       | 0.826          | 1667.803         | 0.047           | 3.829          | 0.375            | 4.204            |
| 80                       | 0.647          | 1710.795         | 0.115           | 4.694          | 0.336            | 5.030            |
| 97                       | 0.443          | 1702.955         | 0.108           | 5.854          | 0.273            | 6.127            |

CAL ID NUMBER: 359 ENGINE TYPE AND MODEL: JT3D -38

SERIAL NUMBER: P-668822

TEST ORGANIZATION: PRATT & WHITNEY

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 102.838                   | 985.083               | 1.000              | 19.00                   | 32.565             | 311.94               | 104.395               | 285.00            | 0.11426            |
| TAKEOFF   | 1.000               | 18000.0       | 0.0                       | 10226.559             | 1.000              | 0.70                    | 0.0                | 119.31               | 0.0                   | 210.00            | 0.0                |
| CLIMBOUT  | 0.850               | 15300.0       | 3.849                     | 8602.055              | 1.000              | 2.20                    | 0.141              | 315.41               | 0.447                 | 561.00            | 0.00025            |
| APPROACH  | 0.400               | 7200.0        | 39.066                    | 3803.405              | 1.000              | 4.00                    | 2.604              | 253.56               | 10.271                | 480.00            | 0.00543            |
| TAXI-IDLE | 0.050               | 900.0         | 102.838                   | 985.083               | 1.000              | 7.00                    | 11.998             | 114.93               | 104.395               | 105.00            | 0.11426            |

TOTAL FOR CYCLE: 47.309 1115.15 1641.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 42.424  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 28.829  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 16.463                    | 985.083               | 1.000              | 19.00                   | 5.213              | 311.94               | 16.713                | 285.00            | 0.01829            |
| TAKEOFF   | 1.000               | 18000.0       | 0.728                     | 10226.559             | 1.000              | 0.70                    | 0.008              | 119.31               | 0.071                 | 210.00            | 0.00004            |
| CLIMBOUT  | 0.850               | 15300.0       | 0.912                     | 8602.055              | 1.000              | 2.20                    | 0.033              | 315.41               | 0.106                 | 561.00            | 0.00006            |
| APPROACH  | 0.400               | 7200.0        | 3.031                     | 3803.405              | 1.000              | 4.00                    | 0.202              | 253.56               | 0.797                 | 480.00            | 0.00042            |
| TAXI-IDLE | 0.050               | 900.0         | 16.463                    | 985.083               | 1.000              | 7.00                    | 1.921              | 114.93               | 16.713                | 105.00            | 0.01829            |

TOTAL FOR CYCLE: 7.378 1115.15 1641.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 6.616  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.496  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.472

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 900.0         | 1.374                     | 985.083               | 1.000              | 19.00                   | 0.435               | 311.94               | 1.395                 | 285.00            | 0.00153            |
| TAKEOFF   | 1.000               | 18000.0       | 120.812                   | 10226.559             | 1.000              | 0.70                    | 1.409               | 119.31               | 11.814                | 210.00            | 0.00671            |
| CLIMBOUT  | 0.850               | 15300.0       | 82.910                    | 8602.055              | 1.000              | 2.20                    | 3.040               | 315.41               | 9.638                 | 561.00            | 0.00542            |
| APPROACH  | 0.400               | 7200.0        | 21.132                    | 3803.405              | 1.000              | 4.00                    | 1.409               | 253.56               | 5.556                 | 480.00            | 0.00294            |
| TAXI-IDLE | 0.050               | 900.0         | 1.374                     | 985.083               | 1.000              | 7.00                    | 0.160               | 114.93               | 1.395                 | 105.00            | 0.00153            |

TOTAL FOR CYCLE: 6.454 1115.15 1641.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 5.787  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 3.933  
 LBS POLLUTANT/1000K LB TH AT T.O.: 78.304

DATE: 7/ 6/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 129 ENGINE TYPE AND MODEL: JT3D-7 SERIAL NUMBER: 678995  
RATED THRUST: 19000.

ENGINE TOTAL TIME: 0. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JFT - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 59.00 FINISH 57.20  
ATMOSPHERIC PRESSURE: START 29.78 FINISH 29.86  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0069  
RELATIVE HUMIDITY: 65.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50  
SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

NEW ENGINE - DATA QUESTIONABLE. SAMPLE LINE BROKEN AFTER TEST.  
PROBE LOCATED 15.25 IN. FROM TAILPIPE

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1920.00    | 1/ 0      | 9925.00            | 52                       |                    | 5130.00          | 8936.00 | 5053.00 | -0.00                    | -0.000000               | -0.00    | 1.38                                | -0.00                     |                              |
| 1925.00    | 2/ 1      | 13150.00           | 69                       |                    | 5634.00          | 9300.00 | 6821.00 | -0.00                    | -0.000000               | -0.00    | 1.54                                | -0.00                     |                              |
| 1930.00    | 3/ 2      | 17400.00           | 91                       |                    | 6237.00          | 9730.00 | 9437.00 | -0.00                    | -0.000000               | -0.00    | 1.82                                | -0.00                     |                              |
| 2040.00    | 4/ 3      | 1150.00            | 6                        |                    | 2026.00          | 5809.00 | 1162.00 | -0.00                    | -0.000000               | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WFT) PPMV | CO 2 (WET) PERCENT V | THC (WFT) PPMV | NO (WFT) PPMV | NO 2 (WET) PPMV | NO X (WFT) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 52                       | 730.40                     | 41.00                     | 70.00         | 1.52                 | 7.80           | 23.00         | -0.00           | 29.00           | -0.00     | -0.00 | -0.00        |
| 69                       | 798.80                     | 45.80                     | 50.00         | 2.62                 | 4.20           | 59.00         | -0.00           | 63.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 710.40                     | 53.80                     | 35.00         | 2.97                 | 3.80           | 92.00         | -0.00           | 95.00           | -0.00     | -0.00 | -0.00        |
| 6                        | 478.40                     | 31.00                     | 75.00         | 0.17                 | 84.00          | 1.00          | -0.00           | 1.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 52                       | 9.20                      | 0.59                      | -0.00                      | 3139.82                    | 4.97                      | 6.26                       | 46.50             | 2.97              | -0.00              | 15865.50           | 25.10             | 31.64              |
| 69                       | 3.83                      | 0.18                      | -0.00                      | 3149.17                    | 7.41                      | 7.92                       | 26.09             | 1.26              | -0.00              | 21481.88           | 50.57             | 54.00              |
| 91                       | 2.36                      | 0.15                      | -0.00                      | 3151.77                    | 10.21                     | 10.54                      | 22.31             | 1.39              | -0.00              | 29743.27           | 96.32             | 99.46              |
| 6                        | 81.03                     | 51.98                     | -0.00                      | 2885.97                    | 1.77                      | 1.77                       | 94.16             | 60.40             | -0.00              | 3353.49            | 2.06              | 2.06               |

| POWER PERCENT RATED T.O. | CC LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 52                       | 4.685          | 1598.540         | 0.299           | 2.529          | -0.000           | 3.188            |
| 69                       | 1.984          | 1613.601         | 0.095           | 3.846          | -0.000           | 4.106            |
| 91                       | 1.282          | 1709.384         | 0.080           | 5.535          | -0.000           | 5.716            |
| 6                        | 81.879         | 2916.081         | 52.521          | 1.793          | -0.000           | 1.791            |



DATE: 7/19/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBR: 134 ENGINE TYPE AND MODEL: JT3D-7 SERIAL NUMBER: 671261

RATED THRUST: 19000.

ENGINE TOTAL TIME: 6207. HRS

TIME SINCE HOT SECTION OVERHAUL: 6207. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 6207. HRS  
N2 COMPRESSOR OVERHAUL: 6207. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 6207. HRS  
N2 TURBINE OVERHAUL: 6207. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.50 FINISH 68.00

ATMOSPHERIC PRESSURE: START 29.84 FINISH 29.90

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0102

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
ALL BY-PASS AIR IS DUCTED AND NOT MIXED WITH EXHAUST.  
REPAIR ENGINE - METAL IN OIL.  
PROBE LOCATED 15.25 IN. FROM TAILPIPE.

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-----------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1230.00    | 1/ 0      | 10000.00           | 57                       | 5258.00          | 9150.00                  | 5440.00         | -0.00    | -0.000000                           | 1.36                      | -0.00                        |
| 1245.00    | 2/ 1      | 14076.00           | 74                       | 5864.00          | 9601.00                  | 7696.00         | -0.00    | -0.000000                           | 1.58                      | -0.00                        |
| 1250.00    | 3/ 2      | 17450.00           | 91                       | 6388.00          | 9944.00                  | 9873.00         | -0.00    | -0.000000                           | 1.82                      | -0.00                        |
| 1422.00    | 4/ 3      | 10000.00           | 5                        | 1955.00          | 5824.00                  | 1143.00         | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOX (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 57                       | 761.00                     | 40.70                     | 80.00         | 2.35                | 0.84           | 38.00         | -0.00          | 42.00          | -0.00     | -0.00 | -0.00        |
| 74                       | 865.40                     | 47.20                     | 50.00         | 2.78                | 1.50           | 73.60         | -0.00          | 76.00          | -0.00     | -0.00 | -0.00        |
| 91                       | 967.60                     | 54.10                     | 10.00         | 3.15                | 1.50           | 105.60        | -0.00          | 106.00         | -0.00     | -0.00 | -0.00        |
| 5                        | 546.80                     | 30.70                     | 880.00        | 1.42                | 1200.00        | 10.00         | -0.00          | 11.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 57                       | 6.91                      | 0.04                      | -0.00                      | 3145.07                    | 5.32                      | 5.88                       | 37.07             | 0.22              | -0.00              | 17109.18           | 28.92             | 31.97              |
| 74                       | 3.61                      | 0.06                      | -0.00                      | 3150.05                    | 8.72                      | 9.00                       | 27.75             | 0.48              | -0.00              | 24242.81           | 67.10             | 69.28              |
| 91                       | 0.64                      | 0.05                      | -0.00                      | 3154.74                    | 11.06                     | 11.10                      | 6.29              | 0.54              | -0.00              | 31146.73           | 109.16            | 109.57             |
| 5                        | 108.57                    | 84.79                     | -0.00                      | 2752.66                    | 2.03                      | 2.23                       | 124.10            | 96.97             | -0.00              | 3146.11            | 2.32              | 2.55               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO2 LB/1K#TH-HR | NOX LB/1K#TH-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 57                       | 3.707          | 1710.918        | 0.022           | 2.892          | -0.000          | 3.197           |
| 74                       | 1.971          | 1772.280        | 0.034           | 4.767          | -0.000          | 4.922           |
| 91                       | 0.161          | 1784.913        | 0.031           | 6.255          | -0.000          | 6.279           |
| 5                        | 124.796        | 3146.314        | 96.918          | 2.316          | -0.000          | 2.548           |

REV 10/19/80

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|                                    |                     |               |                               |                       |                    |                         |                       |                      |                       |                   |                    |
|------------------------------------|---------------------|---------------|-------------------------------|-----------------------|--------------------|-------------------------|-----------------------|----------------------|-----------------------|-------------------|--------------------|
| CAL ID NUMBER: 134                 |                     |               | ENGINE TYPE AND MODEL: JT3D-7 |                       |                    |                         | SERIAL NUMBER: 671261 |                      |                       |                   |                    |
| TEST ORGANIZATION: UNITED/EPA      |                     |               |                               |                       |                    |                         |                       |                      |                       |                   |                    |
| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR     | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS.    | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
| TAXI-IDLE                          | 0.050               | 950.0         | 114.360                       | 1015.865              | 1.000              | 19.00                   | 36.214                | 321.69               | 112.574               | 300.83            | 0.12038            |
| TAKEOFF                            | 1.000               | 19000.0       | 5.987                         | 11015.152             | 1.000              | 0.70                    | 0.070                 | 128.51               | 0.544                 | 221.67            | 0.00032            |
| CLIMBOUT                           | 0.850               | 16150.0       | 20.751                        | 8966.469              | 1.000              | 2.20                    | 0.761                 | 328.77               | 2.314                 | 592.17            | 0.00128            |
| APPROACH                           | 0.400               | 7600.0        | 45.167                        | 4501.012              | 1.000              | 4.00                    | 3.011                 | 300.07               | 10.035                | 506.67            | 0.00594            |
| TAXI-IDLE                          | 0.050               | 950.0         | 114.360                       | 1015.865              | 1.000              | 7.00                    | 13.342                | 118.52               | 112.574               | 110.83            | 0.12038            |
| TOTAL FOR CYCLE:                   |                     |               |                               |                       |                    |                         | 53.398                | 1197.56              |                       | 1732.17           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                               |                       |                    |                         | 44.589                |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                               |                       |                    |                         | 30.827                |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                               |                       |                    |                         | 0.368                 |                      |                       |                   |                    |
| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR     | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS.    | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
| TAXI-IDLE                          | 0.050               | 950.0         | 101.818                       | 1015.865              | 1.000              | 19.00                   | 32.242                | 321.69               | 100.228               | 300.83            | 0.10718            |
| TAKEOFF                            | 1.000               | 19000.0       | 5.468                         | 11015.152             | 1.000              | 0.70                    | 0.064                 | 128.51               | 0.496                 | 221.67            | 0.00029            |
| CLIMBOUT                           | 0.850               | 16150.0       | 3.687                         | 8966.469              | 1.000              | 2.20                    | 0.135                 | 328.77               | 0.411                 | 592.17            | 0.00023            |
| APPROACH                           | 0.400               | 7600.0        | 2.189                         | 4501.012              | 1.000              | 4.00                    | 0.146                 | 300.07               | 0.486                 | 506.67            | 0.00029            |
| TAXI-IDLE                          | 0.050               | 950.0         | 101.818                       | 1015.865              | 1.000              | 7.00                    | 11.879                | 118.52               | 100.228               | 110.83            | 0.10718            |
| TOTAL FOR CYCLE:                   |                     |               |                               |                       |                    |                         | 44.466                | 1197.56              |                       | 1732.17           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                               |                       |                    |                         | 37.131                |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                               |                       |                    |                         | 25.671                |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                               |                       |                    |                         | 3.357                 |                      |                       |                   |                    |
| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR     | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS.   | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
| TAXI-IDLE                          | 0.050               | 950.0         | 1.789                         | 1015.865              | 1.000              | 19.00                   | 0.566                 | 321.69               | 1.761                 | 300.83            | 0.00188            |
| TAKEOFF                            | 1.000               | 19000.0       | 140.433                       | 11015.152             | 1.000              | 0.70                    | 1.638                 | 128.51               | 12.749                | 221.67            | 0.00739            |
| CLIMBOUT                           | 0.850               | 16150.0       | 91.866                        | 8966.469              | 1.000              | 2.20                    | 3.368                 | 328.77               | 10.245                | 592.17            | 0.00569            |
| APPROACH                           | 0.400               | 7600.0        | 17.936                        | 4501.012              | 1.000              | 4.00                    | 1.196                 | 300.07               | 3.985                 | 506.67            | 0.00236            |
| TAXI-IDLE                          | 0.050               | 950.0         | 1.789                         | 1015.865              | 1.000              | 7.00                    | 0.209                 | 118.52               | 1.761                 | 110.83            | 0.00188            |
| TOTAL FOR CYCLE:                   |                     |               |                               |                       |                    |                         | 6.978                 | 1197.56              |                       | 1732.17           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                               |                       |                    |                         | 5.827                 |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                               |                       |                    |                         | 4.028                 |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                               |                       |                    |                         | 86.231                |                      |                       |                   |                    |

DATE: 7/16/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 115 ENGINE TYPE AND MODEL: JT4A -11

SERIAL NUMBER: (TWA2233)

RATED THRUST: 17500.

ENGINE TOTAL TIME: 26795. HRS

TIME SINCE HOT SECTION OVERHAUL: 2993. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 13286. HRS  
N2 COMPRESSOR OVERHAUL: 13286. HRS  
COMBUSTOR CAN REPLACEMENT: 2993. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 13286. HRS  
N1 TURBINE OVERHAUL: 13286. HRS  
N2 TURBINE OVERHAUL: 13286. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 28.87 FINISH 28.87

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0153

RELATIVE HUMIDITY: 50.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGRFES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HP | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 10020.00                 | 57                 | 5785.00          | 8440.00                  | 8580.00                 | 205.20   | 0.011600                            | -0.00                     | -0.00                        |
| 5.00         | 2/ 1      | 12280.00                 | 70                 | 6140.00          | 8730.00                  | 10670.00                | 220.80   | 0.013400                            | -0.00                     | -0.00                        |
| 10.00        | 3/ 2      | 13700.00                 | 78                 | 6450.00          | 8930.00                  | 12200.00                | 231.00   | 0.014700                            | -0.00                     | -0.00                        |
| 13.00        | 4/ 3      | 580.00                   | 3                  | 2115.00          | 5250.00                  | 1360.00                 | 59.00    | 0.006400                            | -0.00                     | -0.00                        |
| 17.00        | 5/ 4      | 12600.00                 | 71                 | 6130.00          | 8750.00                  | 11110.00                | 220.20   | 0.014000                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDHYDES | SMUKF | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|----------|-------|--------------|
| 57                       | 977.00                     | 13.70                     | 22.00         | 2.43                 | 1.00           | 54.00         | 3.00            | 57.00           | -0.00    | -0.00 | -0.00        |
| 70                       | 1107.00                    | 17.20                     | 19.00         | 2.76                 | 0.0            | 75.00         | 2.00            | 77.00           | -0.00    | -0.00 | -0.00        |
| 78                       | 1194.00                    | 18.90                     | 17.00         | 2.82                 | 0.0            | 95.00         | 2.00            | 97.00           | -0.00    | -0.00 | -0.00        |
| 3                        | 623.00                     | 0.60                      | 453.00        | 1.25                 | 800.00         | 3.00          | 5.00            | 8.00            | -0.00    | -0.00 | -0.00        |
| 71                       | 1121.00                    | 17.90                     | 16.00         | 2.69                 | 2.00           | 76.00         | 2.00            | 78.00           | -0.00    | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 57                       | 1.40                      | 0.05                      | 0.40                       | 3130.28                    | 7.27                      | 7.68                       | 15.48             | 0.40              | 3.47               | 26857.79           | 62.39             | 65.86              |
| 70                       | 1.37                      | 0.0                       | 0.24                       | 3131.09                    | 8.89                      | 9.13                       | 14.64             | 0.0               | 2.53               | 33408.69           | 94.91             | 97.44              |
| 78                       | 1.20                      | 0.0                       | 0.23                       | 3131.35                    | 11.03                     | 11.26                      | 14.66             | 0.0               | 2.83               | 38202.51           | 134.54            | 137.37             |
| 3                        | 65.68                     | 66.43                     | 1.19                       | 2847.78                    | 0.71                      | 1.91                       | 89.33             | 70.35             | 1.62               | 3872.98            | 0.97              | 2.59               |
| 71                       | 1.10                      | 0.08                      | 0.24                       | 3131.15                    | 9.25                      | 9.49                       | 13.17             | 0.94              | 2.70               | 34787.03           | 102.75            | 105.45             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 57                       | 1.544          | 2690.418         | 0.040           | 6.227          | 0.346            | 6.573            |
| 70                       | 1.192          | 2720.576         | 0.0             | 7.729          | 0.206            | 7.935            |
| 78                       | 1.070          | 2789.505         | 0.0             | 9.820          | 0.207            | 10.027           |
| 3                        | 154.017        | 6677.555         | 155.777         | 1.675          | 2.792            | 4.468            |
| 71                       | 1.045          | 2760.875         | 0.075           | 8.154          | 0.215            | 8.369            |

CAL ID NUMBER: 115 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: 1TWA22331  
TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 27.930                    | 1448.223              | 1.000              | 19.00                   | 8.844              | 458.60               | 19.285                | 277.08            | 0.03192            |
| TAKEOFF   | 1.000               | 17500.0       | 10.583                    | 15554.047             | 1.000              | 0.70                    | 0.123              | 181.46               | 0.680                 | 204.17            | 0.00060            |
| CLIMBOUT  | 0.850               | 14875.0       | 11.730                    | 13161.859             | 1.000              | 2.20                    | 0.430              | 482.60               | 0.891                 | 545.42            | 0.00079            |
| APPROACH  | 0.400               | 7000.0        | 9.054                     | 5730.918              | 1.000              | 4.00                    | 0.604              | 382.06               | 1.580                 | 466.67            | 0.00129            |
| TAXI-IDLE | 0.050               | 875.0         | 27.930                    | 1448.223              | 1.000              | 7.00                    | 3.258              | 168.96               | 19.285                | 102.08            | 0.03192            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.923  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.311  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.706

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 51.016                    | 1448.223              | 1.000              | 19.00                   | 16.155             | 458.60               | 35.226                | 277.08            | 0.05830            |
| TAKEOFF   | 1.000               | 17500.0       | 0.0                       | 15554.047             | 1.000              | 0.70                    | 0.0                | 181.46               | 0.0                   | 204.17            | 0.0                |
| CLIMBOUT  | 0.850               | 14875.0       | 0.0                       | 13161.859             | 1.000              | 2.20                    | 0.0                | 482.60               | 0.0                   | 545.42            | 0.0                |
| APPROACH  | 0.400               | 7000.0        | 0.802                     | 5730.918              | 1.000              | 4.00                    | 0.053              | 382.06               | 0.140                 | 466.67            | 0.00011            |
| TAXI-IDLE | 0.050               | 875.0         | 51.016                    | 1448.223              | 1.000              | 7.00                    | 5.952              | 168.96               | 35.226                | 102.08            | 0.05830            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 22.160  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.240  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 3.022                     | 1448.223              | 1.000              | 19.00                   | 0.957               | 458.60               | 2.087                 | 277.08            | 0.00345            |
| TAKEOFF   | 1.000               | 17500.0       | 289.474                   | 15554.047             | 1.000              | 0.70                    | 3.377               | 181.46               | 18.611                | 204.17            | 0.01654            |
| CLIMBOUT  | 0.850               | 14875.0       | 175.049                   | 13161.859             | 1.000              | 2.20                    | 6.418               | 482.60               | 13.300                | 545.42            | 0.01177            |
| APPROACH  | 0.400               | 7000.0        | 34.168                    | 5730.918              | 1.000              | 4.00                    | 2.278               | 382.06               | 5.962                 | 466.67            | 0.00488            |
| TAXI-IDLE | 0.050               | 875.0         | 3.022                     | 1448.223              | 1.000              | 7.00                    | 0.353               | 168.96               | 2.087                 | 102.08            | 0.00345            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 13.383  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.996  
LBS POLLUTANT/1000K LB TH AT T.O.: 8.389  
LBS POLLUTANT/1000K LB TH AT T.O.: 192.983

DATE: 7/19/71

TEST ORGANIZATION: S W R I T W A

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 118 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: 611087  
 RATED THRUST: 17500.  
 ENGINE TOTAL TIME: 22911. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 10505. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 10505. HRS  
 N2 COMPRESSOR OVERHAUL: 10505. HRS  
 COMBUSTOR CAN REPLACEMENT: 10505. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 10505. HRS  
 N1 TURBINE OVERHAUL: 10505. HRS  
 N2 TURBINE OVERHAUL: 10505. HRS  
 FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 73.00 FINISH 73.00  
 ATMOSPHERIC PRESSURE: START 28.97 FINISH 28.98  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0093  
 RELATIVE HUMIDITY: 50.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS COMBUSTOR CANS.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9980.00            | 57                       | 5670.00          | 8280.00                  | 206.80                  | 0.011100 | -0.00                               | -0.00                     | -0.00                        |
| 11.00        | 2/ 1      | 12100.00           | 69                       | 6020.00          | 10350.00                 | 223.00                  | 0.012900 | -0.00                               | -0.00                     | -0.00                        |
| 21.00        | 3/ 2      | 14460.00           | 82                       | 6520.00          | 12860.00                 | 238.80                  | 0.015000 | -0.00                               | -0.00                     | -0.00                        |
| 24.00        | 4/ 3      | 660.00             | 3                        | 2240.00          | 1250.00                  | 54.30                   | 0.006400 | -0.00                               | -0.00                     | -0.00                        |
| 30.30        | 5/ 4      | 13240.00           | 75                       | 6220.00          | 11400.00                 | 230.60                  | 0.013700 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 57                       | 905.00                     | 13.90                     | 29.00         | 2.18                 | 1.00           | 47.00         | 5.00            | 52.00           | -0.00     | -0.00 | -0.00        |
| 69                       | 1040.00                    | 17.20                     | 25.00         | 2.53                 | 0.0            | 65.00         | 5.00            | 70.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 1201.00                    | 20.80                     | 25.00         | 2.94                 | 0.0            | 95.00         | 5.00            | 100.00          | -0.00     | -0.00 | -0.00        |
| 3                        | 498.00                     | 0.70                      | 384.00        | 1.19                 | 735.00         | 2.00          | 6.00            | 8.00            | -0.00     | -0.00 | -0.00        |
| 75                       | 1108.00                    | 18.90                     | 33.00         | 2.71                 | 0.0            | 76.00         | 5.00            | 81.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI N2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|---------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 57                       | 2.65                      | 0.05                      | 0.75                      | 3128.94                    | 7.05                      | 7.80                       | 21.93             | 0.43              | 6.21               | 25907.61           | 58.39             | 64.60              |
| 69                       | 1.97                      | 0.0                       | 0.65                      | 3130.15                    | 8.41                      | 9.05                       | 20.37             | 0.0               | 6.69               | 32397.04           | 87.01             | 93.71              |
| 82                       | 1.69                      | 0.0                       | 0.56                      | 3130.58                    | 10.58                     | 11.13                      | 21.79             | 0.0               | 7.16               | 40259.24           | 136.00            | 143.15             |
| 3                        | 58.82                     | 64.48                     | 1.51                      | 2863.44                    | 0.50                      | 2.01                       | 73.52             | 80.60             | 1.89               | 3579.92            | 0.63              | 2.52               |
| 75                       | 2.43                      | 0.0                       | 0.60                      | 3129.43                    | 9.17                      | 9.78                       | 27.65             | 0.0               | 6.88               | 35675.49           | 104.59            | 111.47             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 57                       | 2.198          | 2595.953         | 0.043           | 5.851          | 0.622            | 6.473            |
| 69                       | 1.684          | 2677.441         | 0.0             | 7.191          | 0.553            | 7.744            |
| 82                       | 1.507          | 2784.180         | 0.0             | 9.405          | 0.495            | 9.900            |
| 3                        | 111.398        | 5424.121         | 122.117         | 0.953          | 2.859            | 3.812            |
| 75                       | 2.089          | 2694.524         | 0.0             | 7.900          | 0.520            | 8.419            |

CAL ID NUMBER: 118 ENGINE TYPE AND MODEL: JT4A -11  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: 611087

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 60.002                    | 1431.050              | 1.000              | 19.00                   | 19.001             | 453.17               | 41.929                | 277.08            | 0.06857            |
| TAKEOFF   | 1.000               | 17500.0       | 18.521                    | 16081.234             | 1.000              | 0.70                    | 0.216              | 187.61               | 1.152                 | 204.17            | 0.00106            |
| CLIMBOUT  | 0.850               | 14875.0       | 19.443                    | 13324.449             | 1.000              | 2.20                    | 0.713              | 488.56               | 1.459                 | 545.42            | 0.00131            |
| APPROACH  | 0.400               | 7000.0        | 18.325                    | 6308.168              | 1.000              | 4.00                    | 1.222              | 420.54               | 2.905                 | 466.67            | 0.00262            |
| TAXI-IDLE | 0.050               | 875.0         | 60.002                    | 1431.050              | 1.000              | 7.00                    | 7.000              | 166.96               | 41.929                | 102.08            | 0.06857            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 28.151  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 16.397  
LBS POLLUTANT/1000K LB TH AT T.O.: 17.645  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.235

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 76.838                    | 1431.050              | 1.000              | 19.00                   | 24.332             | 453.17               | 53.693                | 277.08            | 0.08781            |
| TAKEOFF   | 1.000               | 17500.0       | 0.0                       | 16081.234             | 1.000              | 0.70                    | 0.0                | 187.61               | 0.0                   | 204.17            | 0.0                |
| CLIMBOUT  | 0.850               | 14875.0       | 0.0                       | 13324.449             | 1.000              | 2.20                    | 0.0                | 488.56               | 0.0                   | 545.42            | 0.0                |
| APPROACH  | 0.400               | 7000.0        | 1.668                     | 6308.168              | 1.000              | 4.00                    | 0.111              | 420.54               | 0.264                 | 466.67            | 0.00024            |
| TAXI-IDLE | 0.050               | 875.0         | 76.838                    | 1431.050              | 1.000              | 7.00                    | 8.964              | 166.96               | 53.693                | 102.08            | 0.08781            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 33.408  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 19.459  
LBS POLLUTANT/1000K LB TH AT T.O.: 20.940  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 3.054                     | 1431.050              | 1.000              | 19.00                   | 0.967               | 453.17               | 2.134                 | 277.08            | 0.00349            |
| TAKEOFF   | 1.000               | 17500.0       | 251.460                   | 16081.234             | 1.000              | 0.70                    | 2.934               | 187.61               | 15.637                | 204.17            | 0.01437            |
| CLIMBOUT  | 0.850               | 14875.0       | 155.094                   | 13324.449             | 1.000              | 2.20                    | 5.687               | 488.56               | 11.640                | 545.42            | 0.01043            |
| APPROACH  | 0.400               | 7000.0        | 38.707                    | 6308.168              | 1.000              | 4.00                    | 2.580               | 420.54               | 6.136                 | 466.67            | 0.00553            |
| TAXI-IDLE | 0.050               | 875.0         | 3.054                     | 1431.050              | 1.000              | 7.00                    | 0.356               | 166.96               | 2.134                 | 102.08            | 0.00349            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 12.524  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.295  
LBS POLLUTANT/1000K LB TH AT T.O.: 7.850  
LBS POLLUTANT/1000K LB TH AT T.O.: 167.640

DATE: 7/30/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 289 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: P6106708  
 RATED THRUST: 17500.  
 ENGINE TOTAL TIME: 26595. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 7494. HRS  
 N2 COMPRESSOR OVERHAUL: 7494. HRS  
 COMBUSTOR CAN REPLACEMENT: 7494. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3033. HRS  
 N1 TURBINE OVERHAUL: 7494. HRS  
 N2 TURBINE OVERHAUL: 0. HRS  
 FUEL: JP-4 TF FUEL W/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 66.00 FINISH 67.00  
 ATMOSPHERIC PRESSURE: START 29.09 FINISH 29.09  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0080  
 RELATIVE HUMIDITY: 50.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|---------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9720.00            | 55            | 5580.00          | 8050.00                  | 205.70                  | 0.010900 | -0.00                               | 2.01                      | -0.00                        |
| 12.30        | 2/ 1      | 11500.00           | 65            | 5840.00          | 9530.00                  | 218.80                  | 0.012100 | -0.00                               | 2.22                      | -0.00                        |
| 21.10        | 3/ 2      | 14620.00           | 83            | 6450.00          | 8830.00                  | 240.50                  | 0.014900 | -0.00                               | 2.61                      | -0.00                        |
| 24.00        | 4/ 3      | 620.00             | 3             | 2240.00          | 5210.00                  | 61.30                   | 0.005900 | -0.00                               | -0.00                     | -0.00                        |
| 31.50        | 5/ 4      | 14000.00           | 79            | 6280.00          | 8690.00                  | 236.70                  | 0.014300 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 55                       | 840.00                     | 13.60                     | 32.00         | 2.22                 | 0.0            | 51.00         | 4.00            | 55.00           | -0.00     | -0.00 | -0.00        |
| 65                       | 977.00                     | 16.40                     | 29.00         | 2.46                 | 0.0            | 64.00         | 4.00            | 68.00           | -0.00     | -0.00 | -0.00        |
| 83                       | 1184.00                    | 21.20                     | 26.00         | 3.00                 | 0.0            | 103.00        | 3.00            | 106.00          | -0.00     | -0.00 | -0.00        |
| 3                        | 543.00                     | 0.60                      | 412.00        | 1.22                 | 850.00         | 3.00          | 6.00            | 9.00            | -0.00     | -0.00 | -0.00        |
| 79                       | 1137.00                    | 20.30                     | 24.00         | 2.88                 | 1.00           | 90.00         | 4.00            | 94.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 55                       | 2.87                      | 0.0                       | 0.59                       | 3128.73                    | 7.51                      | 8.10                       | 23.11             | 0.0               | 4.74               | 25186.29           | 60.49             | 55.23              |
| 65                       | 2.35                      | 0.0                       | 0.53                       | 3129.55                    | 8.51                      | 9.04                       | 22.38             | 0.0               | 5.07               | 29824.63           | 81.12             | 86.18              |
| 83                       | 1.73                      | 0.0                       | 0.33                       | 3130.53                    | 11.24                     | 11.56                      | 22.31             | 0.0               | 4.23               | 40446.42           | 145.17            | 149.40             |
| 3                        | 61.03                     | 72.11                     | 1.46                       | 2839.52                    | 0.73                      | 2.19                       | 79.34             | 93.75             | 1.90               | 3691.37            | 0.95              | 2.85               |
| 79                       | 2.91                      | 0.04                      | 0.45                       | 3129.98                    | 10.23                     | 10.68                      | 24.47             | 0.48              | 5.54               | 38185.77           | 124.75            | 130.29             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 55                       | 2.377          | 2591.192         | 0.0             | 6.223          | 0.488            | 6.711            |
| 65                       | 1.946          | 2593.446         | 0.0             | 7.053          | 0.441            | 7.494            |
| 83                       | 1.526          | 2766.513         | 0.0             | 9.930          | 0.289            | 10.219           |
| 3                        | 127.966        | 5953.820         | 151.204         | 1.531          | 3.061            | 4.592            |
| 79                       | 1.748          | 2727.555         | 0.035           | 9.911          | 0.396            | 9.307            |

CAL ID NUMBER: 289 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: P6106708  
TEST ORGANIZATION: S W R I TMA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 875.0         | 65.255                    | 1442.430              | 1.000              | 19.00                   | 20.664             | 456.77               | 45.240                | 277.08            | 0.07458            |
| TAKEDOFF                           | 1.000               | 17500.0       | 20.322                    | 15632.250             | 1.000              | 0.70                    | 0.237              | 182.38               | 1.300                 | 204.17            | 0.00116            |
| CLIMBOUT                           | 0.850               | 14875.0       | 21.792                    | 13012.324             | 1.000              | 2.20                    | 0.799              | 477.12               | 1.675                 | 545.42            | 0.00146            |
| APPROACH                           | 0.400               | 7000.0        | 31.566                    | 6255.691              | 1.000              | 4.00                    | 2.104              | 417.05               | 5.046                 | 466.67            | 0.00451            |
| TAXI-IDLE                          | 0.050               | 875.0         | 65.255                    | 1442.430              | 1.000              | 7.00                    | 7.613              | 168.28               | 45.240                | 102.08            | 0.07458            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 31.418             | 1701.59              |                       | 1595.42           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.464             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 19.693             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.355              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 875.0         | 74.538                    | 1442.430              | 1.000              | 19.00                   | 23.604             | 456.77               | 51.675                | 277.08            | 0.08519            |
| TAKEDOFF                           | 1.000               | 17500.0       | 0.0                       | 15632.250             | 1.000              | 0.70                    | 0.0                | 182.38               | 0.0                   | 204.17            | 0.0                |
| CLIMBOUT                           | 0.850               | 14875.0       | 0.0                       | 13012.324             | 1.000              | 2.20                    | 0.0                | 477.12               | 0.0                   | 545.42            | 0.0                |
| APPROACH                           | 0.400               | 7000.0        | 6.106                     | 6255.691              | 1.000              | 4.00                    | 0.407              | 417.05               | 0.976                 | 466.67            | 0.00087            |
| TAXI-IDLE                          | 0.050               | 875.0         | 74.538                    | 1442.430              | 1.000              | 7.00                    | 8.696              | 168.28               | 51.675                | 102.08            | 0.08519            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 32.707             | 1701.59              |                       | 1595.42           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 19.221             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 20.500             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 875.0         | 3.186                     | 1442.430              | 1.000              | 19.00                   | 1.009               | 456.77               | 2.209                 | 277.08            | 0.00364            |
| TAKEDOFF                           | 1.000               | 17500.0       | 215.725                   | 15632.250             | 1.000              | 0.70                    | 2.517               | 182.38               | 13.800                | 204.17            | 0.01233            |
| CLIMBOUT                           | 0.850               | 14875.0       | 156.059                   | 13012.324             | 1.000              | 2.20                    | 5.722               | 477.12               | 11.993                | 545.42            | 0.01049            |
| APPROACH                           | 0.400               | 7000.0        | 37.466                    | 6255.691              | 1.000              | 4.00                    | 2.498               | 417.05               | 5.989                 | 466.67            | 0.00535            |
| TAXI-IDLE                          | 0.050               | 875.0         | 3.186                     | 1442.430              | 1.000              | 7.00                    | 0.372               | 168.28               | 2.209                 | 102.08            | 0.00364            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.117              | 1701.59              |                       | 1595.42           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.121               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.595               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 143.817             |                      |                       |                   |                    |

DATE: 8/ 3/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 306 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: (TWA2220A)

RATED THRUST: 17500.

ENGINE TOTAL TIME: 27324. HRS

TIME SINCE HOT SECTION OVERHAUL: 329. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7619. HRS  
N2 COMPRESSOR OVERHAUL: 7619. HRS  
COMBUSTOR CAN REPLACEMENT: 329. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 329. HRS  
N1 TURBINE OVERHAUL: 7619. HRS  
N2 TURBINE OVERHAUL: 7619. HRS

FUEL: JP-4 TF FUEL W/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 28.95 FINISH 28.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0116

RELATIVE HUMIDITY: 61.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NOT DETERMINED BY SUBTRACTION. THIS TEST IS THE FIRST OF 3 SUCCESSIVE TESTS ON THIS ENGINE. THE FUEL USED FOR THIS TEST CONTAINED NO C1-2.

| ELAPSED TIME | TEST MODE | THRUST LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|-------------------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9580.00           | 54                       | 5550.00            | 8300.00          | 8100.00                  | 199.10                  | 0.011300 | -0.00                               | 1.98                      | -0.00                        |
| 8.30         | 2/ 1      | 11040.00          | 63                       | 5800.00            | 8520.00          | 9360.00                  | 212.50                  | 0.012200 | -0.00                               | 2.18                      | -0.00                        |
| 18.45        | 3/ 2      | 14380.00          | 82                       | 6390.00            | 8980.00          | 12840.00                 | 235.00                  | 0.015200 | -0.00                               | 2.61                      | -0.00                        |
| 23.30        | 4/ 3      | 600.00            | 3                        | 2090.00            | 5250.00          | 1360.00                  | 56.70                   | 0.006700 | -0.00                               | -0.00                     | -0.00                        |
| 29.00        | 5/ 4      | 13760.00          | 78                       | 6250.00            | 8900.00          | 12300.00                 | 231.50                  | 0.014800 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 54                       | 909.00                     | 13.20                     | 25.00         | 2.30                 | 1.00           | 50.00         | 4.00            | 54.00           | -0.00     | -0.00 | -0.00        |
| 63                       | 981.00                     | 15.90                     | 22.00         | 2.49                 | 0.0            | 62.00         | 3.00            | 65.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 1198.00                    | 21.20                     | 22.00         | 3.08                 | 0.0            | 100.00        | 2.00            | 102.00          | -0.00     | -0.00 | -0.00        |
| 3                        | 574.00                     | 0.70                      | 464.00        | 1.35                 | 870.00         | 3.00          | 6.00            | 9.00            | -0.00     | -0.00 | -0.00        |
| 78                       | 1157.00                    | 20.40                     | 22.00         | 2.97                 | 2.00           | 93.00         | 2.00            | 95.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 54                       | 2.17                      | 0.05                      | 0.57                       | 3129.70                    | 7.11                      | 7.68                       | 17.54             | 0.40              | 4.61               | 25350.60           | 57.61             | 62.72              |
| 63                       | 1.76                      | 0.0                       | 0.34                       | 3110.47                    | 8.15                      | 8.54                       | 16.48             | 0.0               | 3.69               | 29301.24           | 76.27             | 79.96              |
| 82                       | 1.42                      | 0.0                       | 0.21                       | 3131.01                    | 10.63                     | 10.84                      | 18.28             | 0.0               | 2.73               | 40202.10           | 136.45            | 139.18             |
| 3                        | 62.38                     | 66.98                     | 1.32                       | 2851.47                    | 0.66                      | 1.99                       | 84.83             | 91.10             | 1.80               | 3878.00            | 0.90              | 2.70               |
| 78                       | 1.48                      | 0.08                      | 0.27                       | 3130.71                    | 10.25                     | 10.47                      | 18.15             | 0.95              | 2.71               | 38507.75           | 126.05            | 128.76             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 54                       | 1.831          | 2646.201         | 0.042           | 6.014          | 0.481            | 6.495            |
| 63                       | 1.492          | 2654.098         | 0.0             | 6.909          | 0.334            | 7.243            |
| 82                       | 1.271          | 2795.696         | 0.0             | 7.489          | 0.190            | 9.679            |
| 3                        | 141.385        | 6463.340         | 151.827         | 1.502          | 3.003            | 4.505            |
| 78                       | 1.319          | 2798.529         | 0.069           | 9.161          | 0.197            | 9.358            |

CAL ID NUMBER: 306 ENGINE TYPE AND MODEL: JT4A -11  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: (TWA2220A)

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 875.0         | 79.518                    | 1388.586              | 1.000              | 19.00                   | 25.181             | 439.72               | 57.266                | 277.08            | 0.09088            |
| TAKEOFF                            | 1.000               | 17500.0       | 16.858                    | 15191.160             | 1.000              | 0.70                    | 0.197              | 177.23               | 1.110                 | 204.17            | 0.00096            |
| CLIMBOUT                           | 0.850               | 14875.0       | 18.710                    | 13068.754             | 1.000              | 2.20                    | 0.686              | 479.19               | 1.432                 | 545.42            | 0.00126            |
| APPROACH                           | 0.400               | 7000.0        | 29.203                    | 6079.773              | 1.000              | 4.00                    | 1.947              | 405.32               | 4.803                 | 466.67            | 0.00417            |
| TAXI-IDLE                          | 0.050               | 875.0         | 79.518                    | 1388.586              | 1.000              | 7.00                    | 9.277              | 162.00               | 57.266                | 102.08            | 0.09088            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 37.288             | 1663.46              |                       | 1595.42           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 22.416             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 23.372             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.124              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 875.0         | 53.413                    | 1388.586              | 1.000              | 19.00                   | 16.914             | 439.72               | 38.466                | 277.08            | 0.06104            |
| TAKEOFF                            | 1.000               | 17500.0       | 1.723                     | 15191.160             | 1.000              | 0.70                    | 0.020              | 177.23               | 0.113                 | 204.17            | 0.00010            |
| CLIMBOUT                           | 0.850               | 14875.0       | 3.492                     | 13068.754             | 1.000              | 2.20                    | 0.128              | 479.19               | 0.267                 | 545.42            | 0.00023            |
| APPROACH                           | 0.400               | 7000.0        | 6.420                     | 6079.773              | 1.000              | 4.00                    | 0.428              | 405.32               | 1.056                 | 466.67            | 0.00092            |
| TAXI-IDLE                          | 0.050               | 875.0         | 53.413                    | 1388.586              | 1.000              | 7.00                    | 6.232              | 162.00               | 38.466                | 102.08            | 0.06104            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 23.722             | 1663.46              |                       | 1595.42           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 14.261             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 14.869             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.148              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.050               | 875.0         | 2.744                     | 1388.586              | 1.000              | 19.00                   | 0.869               | 439.72               | 1.976                 | 277.08            | 0.00314            |
| TAKEOFF                            | 1.000               | 17500.0       | 244.106                   | 15191.160             | 1.000              | 0.70                    | 2.848               | 177.23               | 16.069                | 204.17            | 0.01395            |
| CLIMBOUT                           | 0.850               | 14875.0       | 156.802                   | 13068.754             | 1.000              | 2.20                    | 5.749               | 479.19               | 11.998                | 545.42            | 0.01054            |
| APPROACH                           | 0.400               | 7000.0        | 34.578                    | 6079.773              | 1.000              | 4.00                    | 2.305               | 405.32               | 5.687                 | 466.67            | 0.00494            |
| TAXI-IDLE                          | 0.050               | 875.0         | 2.744                     | 1388.586              | 1.000              | 7.00                    | 0.320               | 162.00               | 1.976                 | 102.08            | 0.00314            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.092              | 1663.46              |                       | 1595.42           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.269               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.579               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 162.737             |                      |                       |                   |                    |

DATE: 8/ 3/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 307 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: (TWA2220B)

RATED THRUST: 17500.

ENGINE TOTAL TIME: 27324. HRS

TIME SINCE HOT SECTION OVERHAUL: 329. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7619. HRS  
N2 COMPRESSOR OVERHAUL: 7619. HRS  
COMBUSTOR CAN REPLACEMENT: 329. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 329. HRS  
N1 TURBINE OVERHAUL: 7619. HRS  
N2 TURBINE OVERHAUL: 7619. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 73.00

ATMOSPHERIC PRESSURE: START 28.95 FINISH 28.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0117

RELATIVE HUMIDITY: 63.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION THIS TEST IS THE SECOND OF THREE RUN ON THIS ENGINE. THE FUEL USED FOR THIS TEST CONTAINED THE NORMAL CONCENTRATION OF CI-2 (0.1% BY VOLUME).

| ELAPSED TIME | TEST MODE | POWER THPST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|-------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9480.00                 | 54                 | 5550.00          | 8000.00                  | 199.30                  | 0.011200 | -0.00                               | -0.00                     | -0.00                        |
| 4.35         | 2/ 1      | 11020.00                | 62                 | 5790.00          | 9330.00                  | 212.40                  | 0.012200 | -0.00                               | -0.00                     | -0.00                        |
| 10.15        | 3/ 2      | 14460.00                | 82                 | 6410.00          | 12950.00                 | 236.20                  | 0.015200 | -0.00                               | -0.00                     | -0.00                        |
| 15.00        | 4/ 3      | 600.00                  | 3                  | 2100.00          | 5220.00                  | 57.20                   | 0.006700 | -0.00                               | -0.00                     | -0.00                        |
| 24.00        | 5/ 4      | 14060.00                | 80                 | 6340.00          | 12640.00                 | 234.20                  | 0.015000 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 54                       | 884.00                     | 13.10                     | 39.00         | 2.25                 | 1.00           | 46.00         | 2.00            | 48.00           | -0.00     | -0.00 | -0.00        |
| 62                       | 977.00                     | 15.90                     | 33.00         | 2.41                 | 0.0            | 58.00         | 4.00            | 62.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 1193.00                    | 21.40                     | 23.00         | 2.99                 | 0.0            | 97.00         | 3.00            | 100.00          | -0.00     | -0.00 | -0.00        |
| 3                        | 556.00                     | 0.70                      | 493.00        | 1.35                 | 929.00         | 3.00          | 6.00            | 9.00            | -0.00     | -0.00 | -0.00        |
| 80                       | 1179.00                    | 21.00                     | 28.00         | 2.96                 | 2.00           | 94.00         | 2.00            | 96.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 54                       | 3.45                      | 0.05                      | 0.29                       | 3127.68                    | 6.68                      | 6.98                       | 27.60             | 0.41              | 2.33               | 25021.45           | 53.48             | 55.80              |
| 62                       | 2.73                      | 0.0                       | 0.54                       | 3128.96                    | 7.87                      | 8.42                       | 25.44             | 0.0               | 5.07               | 29193.16           | 73.45             | 78.51              |
| 82                       | 1.53                      | 0.0                       | 0.33                       | 3130.83                    | 10.62                     | 10.95                      | 19.85             | 0.0               | 4.25               | 40544.28           | 137.50            | 141.76             |
| 3                        | 64.59                     | 71.15                     | 1.32                       | 2836.56                    | 0.66                      | 1.98                       | 89.13             | 98.19             | 1.82               | 3914.45            | 0.91              | 2.73               |
| 80                       | 1.88                      | 0.08                      | 0.22                       | 3130.07                    | 10.39                     | 10.61                      | 23.82             | 0.97              | 2.79               | 39564.07           | 131.35            | 134.14             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 54                       | 2.912          | 2639.393         | 0.043           | 5.641          | 0.245            | 5.886            |
| 62                       | 2.309          | 2649.107         | 0.0             | 6.665          | 0.460            | 7.125            |
| 82                       | 1.373          | 2903.892         | 0.0             | 9.509          | 0.294            | 9.803            |
| 3                        | 148.558        | 6524.082         | 163.647         | 1.516          | 3.031            | 4.547            |
| 80                       | 1.694          | 2813.945         | 0.069           | 9.342          | 0.199            | 9.541            |

CAL ID NUMBER: 307 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: (TWA22208)  
TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 52.229                    | 1168.591              | 1.000              | 19.00                   | 16.539             | 370.05               | 44.694                | 277.08            | 0.05969            |
| TAKEOFF   | 1.000               | 17500.0       | 19.325                    | 15879.750             | 1.000              | 0.70                    | 0.225              | 185.26               | 1.217                 | 204.17            | 0.00110            |
| CLIMBOUT  | 0.850               | 14875.0       | 21.154                    | 13296.273             | 1.000              | 2.20                    | 0.774              | 487.53               | 1.591                 | 545.42            | 0.00142            |
| APPROACH  | 0.400               | 7000.0        | 37.756                    | 5973.191              | 1.000              | 4.00                    | 2.517              | 398.21               | 6.321                 | 466.67            | 0.00539            |
| TAXI-IDLE | 0.050               | 875.0         | 52.229                    | 1168.591              | 1.000              | 7.00                    | 6.093              | 136.34               | 44.694                | 102.08            | 0.05969            |

TOTAL FOR CYCLE: 26.150 1577.40 1595.42  
LBS POLLUTANT/1K LB FUEL/CYCLE: 16.578  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 16.391  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.288

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 66.201                    | 1168.591              | 1.000              | 19.00                   | 20.964             | 370.05               | 56.651                | 277.08            | 0.07566            |
| TAKEOFF   | 1.000               | 17500.0       | 1.668                     | 15879.750             | 1.000              | 0.70                    | 0.019              | 185.26               | 0.105                 | 204.17            | 0.00010            |
| CLIMBOUT  | 0.850               | 14875.0       | 5.564                     | 13296.273             | 1.000              | 2.20                    | 0.204              | 487.53               | 0.418                 | 545.42            | 0.00037            |
| APPROACH  | 0.400               | 7000.0        | 3.617                     | 5973.191              | 1.000              | 4.00                    | 0.241              | 398.21               | 0.606                 | 466.67            | 0.00052            |
| TAXI-IDLE | 0.050               | 875.0         | 66.201                    | 1168.591              | 1.000              | 7.00                    | 7.724              | 136.34               | 56.651                | 102.08            | 0.07566            |

TOTAL FOR CYCLE: 29.152 1577.40 1595.42  
LBS POLLUTANT/1K LB FUEL/CYCLE: 18.481  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 18.272  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.112

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 1.996                     | 1168.591              | 1.000              | 19.00                   | 0.632               | 370.05               | 1.708                 | 277.08            | 0.00228            |
| TAKEOFF   | 1.000               | 17500.0       | 250.650                   | 15879.750             | 1.000              | 0.70                    | 2.924               | 185.26               | 15.784                | 204.17            | 0.01432            |
| CLIMBOUT  | 0.850               | 14875.0       | 158.907                   | 13296.273             | 1.000              | 2.20                    | 5.827               | 487.53               | 11.951                | 545.42            | 0.01068            |
| APPROACH  | 0.400               | 7000.0        | 33.300                    | 5973.191              | 1.000              | 4.00                    | 2.220               | 398.21               | 5.575                 | 466.67            | 0.00476            |
| TAXI-IDLE | 0.050               | 875.0         | 1.996                     | 1168.591              | 1.000              | 7.00                    | 0.233               | 136.34               | 1.708                 | 102.08            | 0.00228            |

TOTAL FOR CYCLE: 11.836 1577.40 1595.42  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.503  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.419  
LBS POLLUTANT/1000K LB TH AT T.O.: 167.100

DATE: 8/ 3/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBR: 30R ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: (TWA2220C)

RATED THRUST: 17500.

ENGINE TOTAL TIME: 27324. HRS

TIME SINCE HOT SECTION OVERHAUL: 329. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7619. HRS  
N2 COMPRESSOR OVERHAUL: 7619. HRS  
COMBUSTOR CAN REPLACEMENT: 329. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 329. HRS  
N1 TURBINE OVERHAUL: 7619. HRS  
N2 TURBINE OVERHAUL: 7619. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 28.95 FINISH 28.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0116

RELATIVE HUMIDITY: 63.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE THIRD OF THREE RUNS ON THIS ENGINE. THE FUEL USED FOR THIS TEST CONTAINED THE MINIMUM CONCENTRATION OF CI-2 (0.0125% BY VOLUME).

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS<br>OR SHP | PERCENT<br>RATED<br>T.O. | ENGINE SPEED<br>RPM<br>N1 N2 | MEASURED FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|--------------|-----------|-----------------------------|--------------------------|------------------------------|--------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0          | 1/ 0      | 4500.00                     | 54                       | 5550.00 8350.00              | 8000.00                        | 200.30                        | 0.011100    | -0.00                                        | -0.00                              | -0.00                                 |
| 4.00         | 2/ 1      | 10960.00                    | 62                       | 5770.00 8520.00              | 1910.00                        | 211.90                        | 0.012200    | -0.00                                        | -0.00                              | -0.00                                 |
| 9.30         | 3/ 2      | 14440.00                    | 82                       | 6400.00 8970.00              | 12890.00                       | 236.00                        | 0.015200    | -0.00                                        | -0.00                              | -0.00                                 |
| 14.30        | 4/ 3      | 600.00                      | 3                        | 2100.00 5230.00              | 1360.00                        | 57.20                         | 0.006600    | -0.00                                        | -0.00                              | -0.00                                 |
| 18.30        | 5/ 4      | 14340.00                    | 81                       | 6370.00 8950.00              | 12860.00                       | 235.20                        | 0.015200    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 54                                | 994.00                              | 13.40                              | 30.00               | 2.30                          | 1.00                 | 46.00               | 4.00                     | 50.00                    | -0.00     | -0.00 | -0.00        |
| 62                                | 973.00                              | 15.90                              | 26.00               | 2.51                          | 0.0                  | 57.00               | 5.00                     | 62.00                    | -0.00     | -0.00 | -0.00        |
| 82                                | 1188.00                             | 21.30                              | 25.00               | 3.05                          | 0.0                  | 95.00               | 3.00                     | 98.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | 558.00                              | 0.70                               | 463.00              | 1.45                          | 774.00               | 3.00                | 6.00                     | 9.00                     | -0.00     | -0.00 | -0.00        |
| 81                                | 1182.00                             | 21.30                              | 27.00               | 3.05                          | 1.00                 | 94.00               | 3.00                     | 97.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 54                                | 2.60                               | 0.95                               | 0.57                                | 3129.03                             | 6.54                               | 7.11                                | 20.78                   | 0.40                    | 4.55                     | 25032.20                 | 52.34                   | 56.89                    |
| 62                                | 2.05                               | 0.0                                | 0.65                                | 3130.02                             | 7.37                               | 8.02                                | 6.16                    | 0.0                     | 1.95                     | 9421.37                  | 27.19                   | 24.14                    |
| 82                                | 1.63                               | 0.0                                | 0.32                                | 3130.68                             | 10.19                              | 10.52                               | 21.05                   | 0.0                     | 4.15                     | 40354.40                 | 131.40                  | 135.55                   |
| 3                                 | 58.67                              | 56.17                              | 1.75                                | 2846.96                             | 0.62                               | 1.87                                | 79.79                   | 76.39                   | 1.70                     | 3926.26                  | 0.85                    | 2.55                     |
| 81                                | 1.76                               | 0.04                               | 0.32                                | 3130.37                             | 10.09                              | 10.41                               | 22.64                   | 0.48                    | 4.14                     | 40256.53                 | 129.70                  | 133.84                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 54                                | 2.187             | 2634.969               | 0.042              | 5.509             | 0.479                  | 5.988                  |
| 62                                | 0.562             | 859.614                | 0.0                | 2.025             | 0.178                  | 2.202                  |
| 82                                | 1.458             | 2794.626               | 0.0                | 9.100             | 0.287                  | 9.387                  |
| 3                                 | 132.785           | 6543.762               | 127.323            | 1.415             | 2.831                  | 4.246                  |
| 81                                | 1.582             | 2807.290               | 0.034              | 9.045             | 0.289                  | 9.333                  |

REV 10/10/00

REV 10/10/00

REV 10/10/00

CAL ID NUMBER: 308 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: (TWA2220C)  
TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 59.243                    | 1303.562              | 1.000              | 19.00                   | 18.760             | 412.79               | 45.447                | 277.08            | 0.06771            |
| TAKEOFF   | 1.000               | 17500.0       | 24.555                    | 15797.063             | 1.000              | 0.70                    | 0.286              | 184.30               | 1.554                 | 204.17            | 0.00140            |
| CLIMBOUT  | 0.850               | 14875.0       | 19.033                    | 13215.137             | 1.000              | 2.20                    | 0.698              | 484.55               | 1.440                 | 545.42            | 0.00128            |
| APPROACH  | 0.400               | 7000.0        | 31.630                    | 6032.602              | 1.000              | 4.00                    | 2.109              | 402.17               | 5.243                 | 466.67            | 0.00452            |
| TAXI-IDLE | 0.050               | 875.0         | 59.243                    | 1303.562              | 1.000              | 7.00                    | 6.912              | 152.08               | 45.447                | 102.08            | 0.06771            |

TOTAL FOR CYCLE: 28.765 1635.90 1595.42  
LBS POLLUTANT/1K LB FUEL/CYCLE: 17.583  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 18.030  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.637

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 49.850                    | 1303.562              | 1.000              | 19.00                   | 15.786             | 412.79               | 38.241                | 277.08            | 0.05697            |
| TAKEOFF   | 1.000               | 17500.0       | 1.999                     | 15797.063             | 1.000              | 0.70                    | 0.023              | 184.30               | 0.127                 | 204.17            | 0.00011            |
| CLIMBOUT  | 0.850               | 14875.0       | 1.133                     | 13215.137             | 1.000              | 2.20                    | 0.042              | 484.55               | 0.086                 | 545.42            | 0.00008            |
| APPROACH  | 0.400               | 7000.0        | 4.666                     | 6032.602              | 1.000              | 4.00                    | 0.311              | 402.17               | 0.774                 | 466.67            | 0.00067            |
| TAXI-IDLE | 0.050               | 875.0         | 49.850                    | 1303.562              | 1.000              | 7.00                    | 5.816              | 152.08               | 38.241                | 102.08            | 0.05697            |

TOTAL FOR CYCLE: 21.977 1635.90 1595.42  
LBS POLLUTANT/1K LB FUEL/CYCLE: 13.434  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.775  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.332

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.050               | 875.0         | 2.296                     | 1303.562              | 1.000              | 19.00                   | 0.727               | 412.79               | 1.761                 | 277.08            | 0.00262            |
| TAKEOFF   | 1.000               | 17500.0       | 230.544                   | 15797.063             | 1.000              | 0.70                    | 2.690               | 184.30               | 14.594                | 204.17            | 0.01317            |
| CLIMBOUT  | 0.850               | 14875.0       | 152.740                   | 13215.137             | 1.000              | 2.20                    | 5.600               | 484.55               | 11.558                | 545.42            | 0.01027            |
| APPROACH  | 0.400               | 7000.0        | 32.502                    | 6032.602              | 1.000              | 4.00                    | 2.167               | 402.17               | 5.388                 | 466.67            | 0.00464            |
| TAXI-IDLE | 0.050               | 875.0         | 2.296                     | 1303.562              | 1.000              | 7.00                    | 0.268               | 152.08               | 1.761                 | 102.08            | 0.00262            |

TOTAL FOR CYCLE: 11.452 1635.90 1595.42  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.000  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.178  
LBS POLLUTANT/1000K LB TH AT T.O.: 153.696

DATE: 7/22/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 320 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: P6111358

RATED THRUST: 17500.

ENGINE TOTAL TIME: 27483. HRS

TIME SINCE HOT SECTION OVERHAUL: 284. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8050. HRS  
 N2 COMPRESSOR OVERHAUL: 8050. HRS  
 COMBUSTOR CAN REPLACEMENT: 284. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 284. HRS  
 N1 TURBINE OVERHAUL: 8050. HRS  
 N2 TURBINE OVERHAUL: 8050. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 28.91 FINISH 28.91

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0146

RELATIVE HUMIDITY: 73.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2  
 DETERMINED BY SUBTRACTION.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OF<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 0.0             | 1/ 0         | 10040.00                          | 57                       | 5660.00                | 8400.00                           | 8040.00                       | 203.00      | 0.011000                                     | -0.00                              | -0.00                                 |
| 6.30            | 2/ 1         | 11760.00                          | 67                       | 5950.00                | 8650.00                           | 9480.00                       | 218.00      | 0.012100                                     | -0.00                              | -0.00                                 |
| 10.50           | 3/ 2         | 14180.00                          | 81                       | 6430.00                | 9030.00                           | 12000.00                      | 235.00      | 0.014200                                     | -0.00                              | -0.00                                 |
| 16.00           | 4/ 3         | 520.00                            | 2                        | 2020.00                | 5100.00                           | 1260.00                       | 52.00       | 0.006800                                     | -0.00                              | -0.00                                 |
| 18.00           | 5/ 4         | 14200.00                          | 81                       | 6420.00                | 9010.00                           | 12640.00                      | 234.00      | 0.014300                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 57                                | 934.00                              | 14.00                              | 27.00               | 2.18                          | 4.00                 | 49.00               | 2.00                     | 51.00                    | -0.00     | -0.00 | -0.00        |
| 67                                | 1037.00                             | 16.70                              | 22.00               | 2.49                          | 1.00                 | 61.00               | 3.00                     | 64.00                    | -0.00     | -0.00 | -0.00        |
| 81                                | 1202.00                             | 20.50                              | 17.00               | 2.83                          | 0.0                  | 88.00               | 2.00                     | 90.00                    | -0.00     | -0.00 | -0.00        |
| 2                                 | 547.00                              | 0.50                               | 473.00              | 1.26                          | 736.00               | 3.00                | 4.00                     | 7.00                     | -0.00     | -0.00 | -0.00        |
| 81                                | 1204.00                             | 20.50                              | 21.00               | 2.83                          | 2.00                 | 86.00               | 4.00                     | 90.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/LK<br>LB FUEL | MASS FMI<br>HC<br>LB/LK<br>LB FUEL | MASS FMI<br>NO2<br>LB/LK<br>LB FUEL | MASS FMI<br>CO2<br>LB/LK<br>LB FUEL | MASS FMI<br>NO<br>LB/LK<br>LB FUEL | MASS FMI<br>NOX<br>LB/LK<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 57                                | 2.47                               | 0.21                               | 0.30                                | 3128.79                             | 7.35                               | 7.65                                | 19.83                   | 1.68                    | 2.41                     | 25155.50                 | 59.11                   | 61.52                    |
| 67                                | 1.76                               | 0.05                               | 0.39                                | 3130.35                             | 8.02                               | 8.41                                | 16.69                   | 0.43                    | 3.74                     | 29675.72                 | 76.00                   | 79.74                    |
| 81                                | 1.20                               | 0.0                                | 0.23                                | 3131.36                             | 10.18                              | 10.41                               | 14.37                   | 0.0                     | 2.78                     | 37576.32                 | 122.15                  | 124.93                   |
| 2                                 | 68.71                              | 60.87                              | 0.95                                | 2858.92                             | 0.71                               | 1.66                                | 86.06                   | 76.70                   | 1.20                     | 3602.24                  | 0.90                    | 2.09                     |
| 81                                | 1.48                               | 0.08                               | 0.46                                | 3130.70                             | 9.95                               | 10.41                               | 17.80                   | 0.97                    | 5.57                     | 37693.59                 | 119.75                  | 125.32                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/LK#TH-HR | CO<br>2<br>LB/LK#TH-HR | THC<br>LB/LK#TH-HR | NO<br>LB/LK#TH-HR | NO<br>2<br>LB/LK#TH-HR | NO<br>X<br>LB/LK#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 57                                | 1.975             | 2505.528               | 0.168              | 5.887             | 0.240                  | 6.128                  |
| 67                                | 1.419             | 2523.446               | 0.037              | 6.463             | 0.318                  | 6.780                  |
| 81                                | 1.013             | 2649.952               | 0.0                | 8.614             | 0.196                  | 8.810                  |
| 2                                 | 165.509           | 6927.183               | 147.497            | 1.724             | 2.299                  | 4.023                  |
| 81                                | 1.254             | 2654.478               | 0.068              | 8.433             | 0.392                  | 8.825                  |



DATE: 8/11/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 339 ENGINE TYPE AND MODEL: JT4A -11 SERIAL NUMBER: (TWA2260)

RATED THRUST: 17500.

ENGINE TOTAL TIME: 8055. HRS

TIME SINCE HOT SECTION OVERHAUL: 3145. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8055. HRS  
N2 COMPRESSOR OVERHAUL: 8055. HRS  
COMBUSTOR CAN REPLACEMENT: 3145. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 8055. HRS  
N1 TURBINE OVERHAUL: 8055. HRS  
N2 TURBINE OVERHAUL: 8055. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 28.98 FINISH 28.98

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 56.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00; FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

NO2 DETERMINED BY SUBTRACTION.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | N1      | N2       | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|---------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9360.00                           | 53                       | 5660.00                | 8280.00 | 7850.00  | 204.00                            | 0.010700                      | -0.00       | 1.97                                         | -0.00                              |                                       |
| 14.00           | 2/ 1         | 10840.00                          | 61                       | 5890.00                | 8520.00 | 9110.00  | 215.00                            | 0.011800                      | -0.00       | 2.14                                         | -0.00                              |                                       |
| 28.00           | 3/ 2         | 14220.00                          | 81                       | 6500.00                | 8970.00 | 12510.00 | 237.00                            | 0.014700                      | -0.00       | 2.58                                         | -0.00                              |                                       |
| 35.00           | 4/ 3         | 620.00                            | 3                        | 2150.00                | 5240.00 | 1300.00  | 58.00                             | 0.006200                      | -0.00       | -0.00                                        | -0.00                              |                                       |
| 43.00           | 7/ 4         | 1500.00                           | 8                        | 3160.00                | 6500.00 | 2000.00  | 85.10                             | 0.006500                      | -0.00       | -0.00                                        | -0.00                              |                                       |
| 47.00           | 8/ 7         | 1750.00                           | 9                        | 3370.00                | 6700.00 | 2170.00  | 92.70                             | 0.006500                      | -0.00       | -0.00                                        | -0.00                              |                                       |
| 52.30           | 9/ 8         | 2000.00                           | 11                       | 3540.00                | 6950.00 | 2340.00  | 98.90                             | 0.006600                      | -0.00       | -0.00                                        | -0.00                              |                                       |
| 57.00           | 10/ 9        | 2500.00                           | 14                       | 3820.00                | 7100.00 | 2660.00  | 111.80                            | 0.007400                      | -0.00       | -0.00                                        | -0.00                              |                                       |
| 59.00           | 11/10        | 3500.00                           | 19                       | 4330.00                | 7430.00 | 3400.00  | 134.00                            | 0.007000                      | -0.00       | -0.00                                        | -0.00                              |                                       |
| 65.00           | 12/11        | 5000.00                           | 28                       | 4910.00                | 7730.00 | 4410.00  | 157.00                            | 0.007800                      | -0.00       | -0.00                                        | -0.00                              |                                       |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 53                                | 898.00                              | 13.10                              | 28.00               | 2.14                          | 4.00                 | 45.00               | 2.00                     | 47.00                    | -0.00     | -0.00 | -0.00        |
| 61                                | 972.00                              | 15.40                              | 24.00               | 2.37                          | 3.00                 | 56.00               | 4.00                     | 60.00                    | -0.00     | -0.00 | -0.00        |
| 81                                | 1184.00                             | 20.60                              | 20.00               | 3.00                          | 2.00                 | 95.00               | 2.00                     | 97.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | 540.00                              | 0.70                               | 435.00              | 1.28                          | 912.00               | 3.00                | 7.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 8                                 | 538.00                              | 1.80                               | 210.00              | 1.33                          | 244.00               | 6.00                | 6.00                     | 12.00                    | -0.00     | -0.00 | -0.00        |
| 9                                 | 550.00                              | 2.10                               | 178.00              | 1.33                          | 140.00               | 10.00               | 3.00                     | 13.00                    | -0.00     | -0.00 | -0.00        |
| 11                                | 561.00                              | 2.30                               | 145.00              | 1.36                          | 98.00                | 12.00               | 2.00                     | 14.00                    | -0.00     | -0.00 | -0.00        |
| 14                                | 583.00                              | 3.00                               | 110.00              | 1.45                          | 68.00                | 15.00               | 2.00                     | 17.00                    | -0.00     | -0.00 | -0.00        |
| 19                                | 628.00                              | 4.20                               | 61.00               | 1.40                          | 22.00                | 18.00               | 3.00                     | 21.00                    | -0.00     | -0.00 | -0.00        |
| 28                                | 689.00                              | 6.20                               | 37.00               | 1.57                          | 11.00                | 27.00               | 1.00                     | 28.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 53                                | 2.61                               | 0.21                               | 0.31                                | 3128.56                             | 6.88                               | 7.18                                | 20.45                   | 1.67                    | 2.40                     | 24559.21                 | 53.99                   | 56.39                    |
| 61                                | 2.02                               | 0.14                               | 0.55                                | 3129.68                             | 7.73                               | 8.28                                | 18.38                   | 1.32                    | 5.03                     | 28511.35                 | 70.43                   | 75.46                    |
| 81                                | 1.33                               | 0.08                               | 0.22                                | 3130.94                             | 10.36                              | 10.58                               | 16.62                   | 0.95                    | 2.73                     | 39168.12                 | 129.66                  | 132.39                   |
| 3                                 | 61.32                              | 73.63                              | 1.62                                | 2834.91                             | 0.69                               | 2.32                                | 79.71                   | 95.71                   | 2.11                     | 3685.38                  | 0.90                    | 3.01                     |
| 8                                 | 30.45                              | 20.26                              | 1.43                                | 3029.82                             | 1.43                               | 2.86                                | 60.89                   | 40.52                   | 2.86                     | 6059.63                  | 2.86                    | 5.72                     |
| 9                                 | 26.07                              | 11.74                              | 0.72                                | 3060.08                             | 2.41                               | 3.13                                | 56.56                   | 25.48                   | 1.57                     | 6640.36                  | 5.27                    | 6.79                     |
| 11                                | 20.89                              | 8.09                               | 0.47                                | 3078.24                             | 2.84                               | 3.31                                | 48.88                   | 18.92                   | 1.11                     | 7203.08                  | 6.64                    | 7.75                     |
| 14                                | 14.94                              | 5.29                               | 0.45                                | 3095.25                             | 3.35                               | 3.79                                | 35.75                   | 14.07                   | 1.19                     | 8233.35                  | 8.90                    | 10.09                    |
| 19                                | 8.64                               | 1.78                               | 0.70                                | 3114.78                             | 4.14                               | 4.88                                | 29.37                   | 4.07                    | 2.37                     | 10590.24                 | 14.23                   | 16.61                    |
| 28                                | 4.69                               | 0.80                               | 0.21                                | 3123.69                             | 5.62                               | 5.82                                | 20.66                   | 3.52                    | 0.92                     | 13775.48                 | 24.77                   | 25.68                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 53                                | 2.185             | 2623.848               | 0.179              | 5.768             | 0.256                  | 6.024                  |
| 61                                | 1.695             | 2610.198               | 0.171              | 6.497             | 0.464                  | 6.961                  |
| 81                                | 1.169             | 2756.439               | 0.067              | 9.118             | 0.192                  | 9.310                  |
| 3                                 | 128.568           | 5944.188               | 154.377            | 1.456             | 3.398                  | 4.855                  |
| 8                                 | 40.596            | 4039.758               | 27.015             | 1.405             | 1.905                  | 3.810                  |
| 9                                 | 32.321            | 3774.495               | 14.559             | 2.983             | 0.895                  | 3.877                  |
| 11                                | 24.439            | 3601.543               | 9.460              | 3.322             | 0.544                  | 3.876                  |
| 14                                | 15.901            | 3293.342               | 5.670              | 3.562             | 0.475                  | 4.036                  |
| 19                                | 8.391             | 3025.784               | 1.733              | 4.067             | 0.678                  | 4.745                  |
| 28                                | 4.132             | 2755.096               | 0.704              | 4.953             | 0.183                  | 5.137                  |



DATE: 8/ 2/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 290 ENGINE TYPE AND MODEL: JT8D-1

SERIAL NUMBER: P6491258

RATED THRUST: 14000.

ENGINE TOTAL TIME: 14289. HRS

TIME SINCE HOT SECTION OVERHAUL: 3433. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8843. HRS  
 N2 COMPRESSOR OVERHAUL: 8843. HRS  
 COMBUSTOR CAN REPLACEMENT: 8843. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 8843. HRS  
 N1 TURBINE OVERHAUL: 8843. HRS  
 N2 TURBINE OVERHAUL: 8843. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 28.96 FINISH 28.96

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0127

RELATIVE HUMIDITY: 49.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 0.0             | 1/ 0         | 9660.00                           | 68                       | 7310.00                | 11080.00                          | 5640.00                       | 0.013700    | -0.00                                        | 1.65                               | -0.00                                 |
| 17.00           | 2/ 1         | 11480.00                          | 81                       | 7720.00                | 11400.00                          | 6780.00                       | 0.014700    | -0.00                                        | 1.79                               | -0.00                                 |
| 30.00           | 3/ 2         | 12520.00                          | 89                       | 7990.00                | 11510.00                          | 7590.00                       | 0.015800    | -0.00                                        | 1.90                               | -0.00                                 |
| 35.00           | 4/ 3         | 800.00                            | 5                        | 2580.00                | 6770.00                           | 880.00                        | 0.007600    | -0.00                                        | -0.00                              | -0.00                                 |
| 47.00           | 5/ 4         | 12420.00                          | 88                       | 7950.00                | 11490.00                          | 7590.00                       | 0.015700    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 68                                | 919.00                              | 9.10                               | 16.00               | 2.80                          | 1.00                 | 61.00               | 5.00                     | 66.00                    | -0.00     | -0.00 | -0.00        |
| 81                                | 986.00                              | 11.20                              | 13.00               | 2.96                          | 0.0                  | 84.00               | 5.00                     | 89.00                    | -0.00     | -0.00 | -0.00        |
| 89                                | 1026.00                             | 12.60                              | 12.00               | 3.07                          | 0.0                  | 105.00              | 5.00                     | 110.00                   | -0.00     | -0.00 | -0.00        |
| 5                                 | 741.00                              | 0.50                               | 394.00              | 1.59                          | 202.00               | 4.00                | 7.00                     | 11.00                    | -0.00     | -0.00 | -0.00        |
| 88                                | 1038.00                             | 12.50                              | 13.00               | 3.12                          | 1.00                 | 104.00              | 5.00                     | 109.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 68                                | 1.14                               | 0.04                               | 0.59                                | 3131.34                             | 7.13                               | 7.72                                | 6.42                    | 0.23                    | 3.30                     | 17660.76                 | 40.27                   | 43.52                    |
| 81                                | 0.88                               | 0.0                                | 0.55                                | 3131.86                             | 9.29                               | 9.84                                | 5.94                    | 0.0                     | 3.75                     | 21234.04                 | 62.99                   | 66.74                    |
| 89                                | 0.78                               | 0.0                                | 0.53                                | 3132.02                             | 11.20                              | 11.73                               | 5.91                    | 0.0                     | 4.05                     | 23772.00                 | 85.00                   | 89.04                    |
| 5                                 | 47.43                              | 13.99                              | 1.39                                | 3020.04                             | 0.79                               | 2.18                                | 41.91                   | 12.31                   | 1.22                     | 2657.63                  | 0.70                    | 1.92                     |
| 88                                | 0.83                               | 0.04                               | 0.52                                | 3131.84                             | 10.91                              | 11.44                               | 6.30                    | 0.28                    | 3.98                     | 23770.63                 | 82.83                   | 86.81                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 68                                | 0.665             | 1828.236               | 0.024              | 4.164             | 0.341                  | 4.505                  |
| 81                                | 0.517             | 1849.456               | 0.0                | 5.487             | 0.327                  | 5.814                  |
| 89                                | 0.472             | 1898.722               | 0.0                | 6.789             | 0.323                  | 7.112                  |
| 5                                 | 52.392            | 3322.042               | 15.394             | 0.874             | 1.624                  | 2.403                  |
| 88                                | 0.508             | 1913.899               | 0.022              | 6.669             | 0.321                  | 6.990                  |

CAL ID NUMBER: 290 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: P6491258  
TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 44.872                    | 892.665               | 1.000              | 19.00                   | 14.209             | 282.68               | 50.267                | 266.00            | 0.05342            |
| TAKEOFF                            | 1.000               | 14000.0       | 7.696                     | 8832.207              | 1.000              | 0.70                    | 0.090              | 103.04               | 0.871                 | 163.33            | 0.00055            |
| CLIMBOUT                           | 0.850               | 11900.0       | 7.503                     | 7263.258              | 1.000              | 2.20                    | 0.275              | 266.32               | 1.033                 | 436.33            | 0.00063            |
| APPROACH                           | 0.400               | 5600.0        | 18.495                    | 3536.526              | 1.000              | 4.00                    | 1.233              | 235.77               | 5.230                 | 373.33            | 0.00330            |
| TAXI-IDLE                          | 0.060               | 840.0         | 44.872                    | 892.665               | 1.000              | 7.00                    | 5.235              | 104.14               | 50.267                | 98.00             | 0.05342            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 21.042             | 991.95               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 21.213             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 15.739             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.641              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 13.341                    | 892.665               | 1.000              | 19.00                   | 4.225              | 282.68               | 14.946                | 266.00            | 0.01588            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.768                     | 8832.207              | 1.000              | 0.70                    | 0.009              | 103.04               | 0.087                 | 163.33            | 0.00005            |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.632                     | 7263.258              | 1.000              | 2.20                    | 0.023              | 266.32               | 0.087                 | 436.33            | 0.00005            |
| APPROACH                           | 0.400               | 5600.0        | 0.858                     | 3536.526              | 1.000              | 4.00                    | 0.057              | 235.77               | 0.242                 | 373.33            | 0.00015            |
| TAXI-IDLE                          | 0.060               | 840.0         | 13.341                    | 892.665               | 1.000              | 7.00                    | 1.556              | 104.14               | 14.946                | 98.00             | 0.01588            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.871              | 991.95               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.918              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.391              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.640              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.780                     | 892.665               | 1.000              | 19.00                   | 0.564               | 282.68               | 1.994                 | 266.00            | 0.00212            |
| TAKEOFF                            | 1.000               | 14000.0       | 122.597                   | 8832.207              | 1.000              | 0.70                    | 1.430               | 103.04               | 13.881                | 163.33            | 0.00876            |
| CLIMBOUT                           | 0.850               | 11900.0       | 78.214                    | 7263.258              | 1.000              | 2.20                    | 2.868               | 266.32               | 10.768                | 436.33            | 0.00657            |
| APPROACH                           | 0.400               | 5600.0        | 13.520                    | 3536.526              | 1.000              | 4.00                    | 0.901               | 235.77               | 3.823                 | 373.33            | 0.00241            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.780                     | 892.665               | 1.000              | 7.00                    | 0.208               | 104.14               | 1.994                 | 98.00             | 0.00212            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.971               | 991.95               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.019               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.466               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 102.164             |                      |                       |                   |                    |

DATE: 7/15/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 300 ENGINE TYPE AND MODEL: JT8D-1

SERIAL NUMBER: 649L37B

RATED THRUST: 14000.

ENGINE TOTAL TIME: 8574. HRS

TIME SINCE MNT SECTION OVERHAUL: 2789. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8574. HRS

N2 COMPRESSOR OVERHAUL: 8574. HRS

COMBUSTOR CAN REPLACEMENT: 2789. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 2789. HRS

N1 TURBINE OVERHAUL: 8574. HRS

N2 TURBINE OVERHAUL: 8574. HRS

FUEL: JP-4 TF

FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 28.87 FINISH 28.87

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0143

RELATIVE HUMIDITY: 82.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2  
DETERMINED BY SUBTRACTION.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | N1       | N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|----------|----|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9600.00                           | 68                       | 7270.00                | 11140.00 |    | 5530.00                           | 115.30                        | 0.013300    | -0.00                                        | 1.65                               | -0.00                                 |
| 4.00            | 2/ 1         | 11330.00                          | 80                       | 7680.00                | 11470.00 |    | 6620.00                           | 127.70                        | 0.014400    | -0.00                                        | 1.80                               | -0.00                                 |
| 7.30            | 3/ 2         | 13040.00                          | 93                       | 8080.00                | 11750.00 |    | 7760.00                           | 140.10                        | 0.015400    | -0.00                                        | 1.94                               | -0.00                                 |
| 12.30           | 4/ 3         | 680.00                            | 4                        | 2520.00                | 6620.00  |    | 950.00                            | 26.40                         | 0.010000    | -0.00                                        | -0.00                              | -0.00                                 |
| 14.50           | 5/ 4         | 13040.00                          | 93                       | 8100.00                | 11780.00 |    | 7810.00                           | 140.10                        | 0.015500    | -0.00                                        | 1.90                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 68                                | 852.00                              | 9.10                               | 32.00               | 2.63                          | 4.00                 | 50.00               | 6.00                     | 56.00                    | -0.00     | -0.00 | -0.00        |
| 80                                | 915.00                              | 11.20                              | 15.00               | 2.72                          | 4.00                 | 63.00               | 4.00                     | 67.00                    | -0.00     | -0.00 | -0.00        |
| 93                                | 990.00                              | 13.30                              | 6.00                | 2.98                          | 5.00                 | 81.00               | 3.00                     | 84.00                    | -0.00     | -0.00 | -0.00        |
| 4                                 | 687.00                              | 0.40                               | 474.30              | 1.95                          | 152.00               | 3.00                | 8.00                     | 11.00                    | -0.00     | -0.00 | -0.00        |
| 93                                | 990.00                              | 13.30                              | 22.00               | 3.19                          | 10.00                | 80.00               | 7.00                     | 87.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 68                                | 2.42                               | 0.17                               | 0.75                                | 3128.96                             | 6.22                               | 6.96                                | 13.40                   | 0.96                    | 4.13                     | 17303.13                 | 34.39                   | 18.52                    |
| 80                                | 1.10                               | 0.17                               | 0.48                                | 3131.06                             | 7.58                               | 8.06                                | 7.27                    | 1.11                    | 3.19                     | 20727.59                 | 50.19                   | 53.37                    |
| 93                                | 0.40                               | 0.19                               | 0.33                                | 3132.08                             | 8.90                               | 9.23                                | 3.11                    | 1.49                    | 2.56                     | 24304.96                 | 69.06                   | 71.62                    |
| 4                                 | 46.97                              | 8.63                               | 1.30                                | 3035.79                             | 0.49                               | 1.79                                | 44.62                   | 8.19                    | 1.24                     | 2884.00                  | 0.46                    | 1.70                     |
| 93                                | 1.37                               | 0.36                               | 0.72                                | 3130.10                             | 8.21                               | 8.92                                | 10.73                   | 2.79                    | 5.61                     | 24446.09                 | 64.09                   | 69.70                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 68                                | 1.396             | 1802.410               | 0.100              | 3.582             | 0.437                  | 4.012                  |
| 80                                | 0.642             | 1829.443               | 0.098              | 4.430             | 0.281                  | 4.711                  |
| 93                                | 0.239             | 1863.877               | 0.114              | 5.296             | 0.196                  | 5.492                  |
| 4                                 | 65.613            | 4241.168               | 12.050             | 0.682             | 1.819                  | 2.501                  |
| 93                                | 0.823             | 1874.700               | 0.214              | 4.915             | 0.430                  | 5.345                  |

CAL ID NUMBER: 300 ENGINE TYPE AND MODEL: JT8D-1  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: 649L378

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 48.934                    | 1049.424              | 1.000              | 19.00                   | 15.496             | 332.32               | 46.629                | 266.00            | 0.05825            |
| TAKEOFF   | 1.000               | 14000.0       | 10.863                    | 8464.215              | 1.000              | 0.70                    | 0.127              | 98.75                | 1.283                 | 163.33            | 0.00078            |
| CLIMBOUT  | 0.850               | 11900.0       | 12.603                    | 6975.336              | 1.000              | 2.20                    | 0.462              | 255.76               | 1.807                 | 436.33            | 0.00106            |
| APPROACH  | 0.400               | 5600.0        | 21.337                    | 3388.150              | 1.000              | 4.00                    | 1.422              | 225.88               | 6.297                 | 373.33            | 0.00381            |
| TAXI-IDLE | 0.060               | 840.0         | 48.934                    | 1049.424              | 1.000              | 7.00                    | 5.709              | 122.43               | 46.629                | 98.00             | 0.05825            |

|                                    |        |         |         |
|------------------------------------|--------|---------|---------|
| TOTAL FOR CYCLE:                   | 23.216 | 1035.14 | 1337.00 |
| LBS POLLUTANT/IK LB FUEL/CYCLE:    | 22.428 |         |         |
| LBS POLLUTANT/IK LB TH-HR/CYCLE:   | 17.364 |         |         |
| LBS POLLUTANT/1000K LB TH AT T.O.: | 0.905  |         |         |

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-TOLE | 0.060               | 840.0         | 8.073                     | 1049.424              | 1.000              | 19.00                   | 2.557              | 332.32               | 7.693                 | 266.00            | 0.00961            |
| TAKEDOFF  | 1.000               | 14000.0       | 1.490                     | 8464.215              | 1.000              | 0.70                    | 0.017              | 98.75                | 0.176                 | 163.33            | 0.00011            |
| CLIMBOUT  | 0.850               | 11900.0       | 1.228                     | 6975.336              | 1.000              | 2.20                    | 0.045              | 255.76               | 0.176                 | 436.33            | 0.00010            |
| APPROACH  | 0.400               | 5600.0        | 1.276                     | 3388.150              | 1.000              | 4.00                    | 0.085              | 225.88               | 0.377                 | 373.33            | 0.00023            |
| TAXI-TOLE | 0.060               | 840.0         | 8.073                     | 1049.424              | 1.000              | 7.00                    | 0.942              | 122.43               | 7.693                 | 98.00             | 0.00961            |

|                                    |       |         |         |
|------------------------------------|-------|---------|---------|
| TOTAL FOR CYCLE:                   | 3.646 | 1035.14 | 1337.00 |
| LB5 POLLUTANT/1K LB FUEL/CYCLE:    | 3.522 |         |         |
| LB5 POLLUTANT/1K LB TH-HR/CYCLE:   | 2.727 |         |         |
| LB5 POLLUTANT/1000K LB TH AT T.O.: | 1.241 |         |         |

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 1.744                     | 1049.424              | 1.000              | 19.00                   | 0.552               | 332.32               | 1.662                 | 266.00            | 0.00208            |
| TAKEOFF   | 1.000               | 14000.0       | 85.298                    | 8464.215              | 1.000              | 0.70                    | 0.995               | 98.75                | 10.078                | 163.33            | 0.00609            |
| CLIMBOUT  | 0.850               | 11900.0       | 58.072                    | 6975.336              | 1.000              | 2.20                    | 2.129               | 255.76               | 8.325                 | 436.33            | 0.00488            |
| APPROACH  | 0.400               | 5600.0        | 15.198                    | 3388.150              | 1.000              | 4.00                    | 1.013               | 225.88               | 4.485                 | 373.33            | 0.00271            |
| TAXI-IDLE | 0.060               | 840.0         | 1.744                     | 1049.424              | 1.000              | 7.00                    | 0.204               | 122.43               | 1.662                 | 98.00             | 0.00208            |

|                                    |        |         |         |
|------------------------------------|--------|---------|---------|
| TOTAL FOR CYCLE:                   | 4.894  | 1035.14 | 1337.00 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    | 4.727  |         |         |
| LBS POLLUTANT/1K TH-HR/CYCLE:      | 3.660  |         |         |
| LBS POLLUTANT/1000K LB TH AT T.O.: | 71.082 |         |         |

DATE: 8/ 5/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 316 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: P649185B

RATED THRUST: 14000.

ENGINE TOTAL TIME: 15745. HRS

TIME SINCE HOT SECTION OVERHAUL: 2685. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11945. HRS  
N2 COMPRESSOR OVERHAUL: 11945. HRS  
COMBUSTOR CAN REPLACEMENT: 2685. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 11945. HRS  
N1 TURBINE OVERHAUL: 11945. HRS  
N2 TURBINE OVERHAUL: 11945. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 70.00

ATMOSPHERIC PRESSURE: START 29.10 FINISH 29.11

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0127

RELATIVE HUMIDITY: 72.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE FIRST OF THREE RUN ON THIS ENGINE. THE FUEL USED CONTAINED NO CI-2.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|--------------------|------------------|--------------------------|-----------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9560.00            | 68                       | 7300.00            | 11000.00         | 5610.00                  | 115.60          | 0.013500 | -0.00                               | 1.65                      | -0.00                        |
| 7.00         | 2/ 1      | 11500.00           | 82                       | 7750.00            | 11340.00         | 6810.00                  | 130.00          | 0.014500 | -0.00                               | 1.80                      | -0.00                        |
| 13.20        | 3/ 2      | 13100.00           | 93                       | 8140.00            | 11630.00         | 7940.00                  | 141.10          | 0.015600 | -0.00                               | 1.95                      | -0.00                        |
| 18.10        | 4/ 3      | 10500.00           | 7                        | 2970.00            | 7350.00          | 1060.00                  | 37.10           | 0.007900 | -0.00                               | -0.00                     | -0.00                        |
| 24.45        | 7/ 4      | 1520.00            | 10                       | 3540.00            | 8710.00          | 1400.00                  | 42.40           | 0.009200 | -0.00                               | -0.00                     | -0.00                        |
| 27.45        | 8/ 7      | 2500.00            | 17                       | 4390.00            | 8970.00          | 2010.00                  | 54.90           | 0.010200 | -0.00                               | -0.00                     | -0.00                        |
| 29.40        | 9/ 8      | 5020.00            | 35                       | 5840.00            | 9490.00          | 3020.00                  | 80.40           | 0.010400 | -0.00                               | -0.00                     | -0.00                        |
| 32.30        | 10/ 9     | 7120.00            | 50                       | 6600.00            | 10530.00         | 4090.00                  | 97.80           | 0.011400 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 68                       | 865.00                     | 9.40                      | 29.00         | 2.75                 | 0.0            | 53.00         | 5.00            | 58.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 925.00                     | 11.50                     | 20.00         | 2.95                 | 0.0            | 69.00         | 5.00            | 74.00           | -0.00     | -0.00 | -0.00        |
| 93                       | 988.00                     | 13.50                     | 16.00         | 3.16                 | 0.0            | 87.00         | 6.00            | 93.00           | -0.00     | -0.00 | -0.00        |
| 7                        | 649.00                     | 0.70                      | 388.00        | 1.64                 | 84.00          | 7.00          | 8.00            | 15.00           | -0.00     | -0.00 | -0.00        |
| 10                       | 684.00                     | 1.10                      | 300.00        | 1.84                 | 52.00          | 12.00         | 7.00            | 19.00           | -0.00     | -0.00 | -0.00        |
| 17                       | 742.00                     | 1.40                      | 162.00        | 2.04                 | 22.00          | 14.00         | 8.00            | 22.00           | -0.00     | -0.00 | -0.00        |
| 35                       | 674.00                     | 4.30                      | 56.00         | 2.13                 | 6.00           | 27.00         | 1.00            | 28.00           | -0.00     | -0.00 | -0.00        |
| 50                       | 764.00                     | 6.20                      | 39.00         | 2.33                 | 1.00           | 34.00         | 4.00            | 38.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FLOW CO LB/HR | MASS FLOW HC LB/HR | MASS FLOW CO2 LB/HR | MASS FLOW NO LB/HR | MASS FLOW NO2 LB/HR | MASS FLOW NOX LB/HR | MASS FLOW CO LB/HR | MASS FLOW HC LB/HR | MASS FLOW CO2 LB/HR | MASS FLOW NO LB/HR | MASS FLOW NO2 LB/HR | MASS FLOW NOX LB/HR |
|--------------------------|--------------------|--------------------|---------------------|--------------------|---------------------|---------------------|--------------------|--------------------|---------------------|--------------------|---------------------|---------------------|
| 68                       | 2.10               | 0.0                | 0.59                | 3129.94            | 6.31                | 6.90                | 11.78              | 0.0                | 3.34                | 17558.96           | 35.38               | 38.71               |
| 82                       | 1.35               | 0.0                | 0.55                | 3131.12            | 7.66                | 8.21                | 9.20               | 0.0                | 3.78                | 21322.91           | 52.14               | 55.92               |
| 93                       | 1.01               | 0.0                | 0.62                | 3131.66            | 9.01                | 9.63                | 8.01               | 0.0                | 4.94                | 24865.35           | 71.57               | 76.50               |
| 7                        | 45.86              | 5.69               | 1.55                | 3045.59            | 1.36                | 2.91                | 48.61              | 6.03               | 1.65                | 3228.32            | 1.44                | 3.09                |
| 10                       | 31.07              | 3.08               | 1.19                | 3075.95            | 2.04                | 3.23                | 43.50              | 4.32               | 1.67                | 4306.33            | 2.86                | 4.53                |
| 17                       | 15.32              | 1.19               | 1.24                | 3105.90            | 2.17                | 3.42                | 30.80              | 2.40               | 2.50                | 6242.86            | 4.37                | 6.87                |
| 35                       | 5.23               | 0.32               | 0.15                | 3124.15            | 4.14                | 4.29                | 15.79              | 0.97               | 0.46                | 9434.92            | 12.50               | 12.97               |
| 50                       | 3.33               | 0.05               | 0.56                | 3127.87            | 4.77                | 5.33                | 13.63              | 0.20               | 2.30                | 12792.99           | 19.52               | 21.81               |

| POWER PERCENT RATED T.O. | CO LB/IK*TH-HR | CO 2 LB/IK*TH-HR | THC LB/IK*TH-HR | NO LB/IK*TH-HR | NO 2 LB/IK*TH-HR | NO X LB/IK*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 68                       | 1.233          | 1836.712         | 0.0             | 3.701          | 0.349            | 4.050            |
| 82                       | 0.900          | 1854.166         | 0.0             | 4.534          | 0.329            | 4.862            |
| 93                       | 0.612          | 1898.118         | 0.0             | 5.463          | 0.377            | 5.840            |
| 7                        | 46.295         | 3074.593         | 5.740           | 1.372          | 1.568            | 2.940            |
| 10                       | 28.621         | 2833.114         | 2.841           | 1.880          | 1.097            | 2.977            |
| 17                       | 12.319         | 2497.143         | 0.958           | 1.749          | 0.999            | 2.748            |
| 35                       | 3.145          | 1879.466         | 0.193           | 2.491          | 0.092            | 2.583            |
| 50                       | 1.914          | 1796.769         | 0.028           | 2.741          | 0.322            | 3.063            |

CAL ID NUMBER: 316 ENGINE TYPE AND MODEL: JT8D-1  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6491858

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 51.645                    | 746.851               | 1.000              | 19.00                   | 16.354             | 236.50               | 69.151                | 266.00            | 0.06148            |
| TAKEOFF                            | 1.000               | 14000.0       | 5.374                     | 8484.348              | 1.000              | 0.70                    | 0.063              | 98.98                | 0.633                 | 163.33            | 0.00038            |
| CLIMBOUT                           | 0.850               | 11900.0       | 9.532                     | 7148.559              | 1.000              | 2.20                    | 0.350              | 262.11               | 1.333                 | 436.33            | 0.00080            |
| APPROACH                           | 0.400               | 5600.0        | 17.154                    | 3492.050              | 1.000              | 4.00                    | 1.144              | 232.80               | 4.912                 | 373.33            | 0.00306            |
| TAXI-IDLE                          | 0.060               | 840.0         | 51.645                    | 746.851               | 1.000              | 7.00                    | 6.025              | 87.13                | 69.151                | 98.00             | 0.06148            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 23.935             | 917.54               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 26.087             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 17.902             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.448              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 5.938                     | 746.851               | 1.000              | 19.00                   | 1.880              | 236.50               | 7.950                 | 266.00            | 0.00707            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8484.348              | 1.000              | 0.70                    | 0.0                | 98.98                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.0                       | 7148.559              | 1.000              | 2.20                    | 0.0                | 262.11               | 0.0                   | 436.33            | 0.0                |
| APPROACH                           | 0.400               | 5600.0        | 0.835                     | 3492.050              | 1.000              | 4.00                    | 0.056              | 232.80               | 0.239                 | 373.33            | 0.00015            |
| TAXI-IDLE                          | 0.060               | 840.0         | 5.938                     | 746.851               | 1.000              | 7.00                    | 0.693              | 87.13                | 7.950                 | 98.00             | 0.00707            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.629              | 917.54               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.865              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.966              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.910                     | 746.851               | 1.000              | 19.00                   | 0.605               | 236.50               | 2.558                 | 266.00            | 0.00227            |
| TAKEOFF                            | 1.000               | 14000.0       | 94.082                    | 8484.348              | 1.000              | 0.70                    | 1.098               | 98.98                | 11.089                | 163.33            | 0.00672            |
| CLIMBOUT                           | 0.850               | 11900.0       | 61.555                    | 7148.559              | 1.000              | 2.20                    | 2.257               | 262.11               | 8.611                 | 436.33            | 0.00517            |
| APPROACH                           | 0.400               | 5600.0        | 16.980                    | 3492.050              | 1.000              | 4.00                    | 1.132               | 232.80               | 4.863                 | 373.33            | 0.00303            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.910                     | 746.851               | 1.000              | 7.00                    | 0.223               | 87.13                | 2.558                 | 98.00             | 0.00227            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.314               | 917.54               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.792               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.975               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 78.401              |                      |                       |                   |                    |

DATE: 8/ 5/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 317 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: P649185B

RATED THRUST: 14000.

ENGINE TOTAL TIME: 15745. HRS

TIME SINCE HOT SECTION OVERHAUL: 2685. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11945. HRS  
N2 COMPRESSOR OVERHAUL: 11945. HRS  
COMBUSTOR CAN REPLACEMENT: 2685. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 11945. HRS  
N1 TURBINE OVERHAUL: 11945. HRS  
N2 TURBINE OVERHAUL: 11945. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 69.00 FINISH 69.00

ATMOSPHERIC PRESSURE: START 29.11 FINISH 29.11

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0121

RELATIVE HUMIDITY: 69.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE SECOND OF THREE RUN ON THIS ENGINE. THE FUEL USED CONTAINED THE NORMAL CONCENTRATION OF C1-2 (0.1% BY VOLUME).

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9540.00                  | 68                 | 7250.00          | 10940.00                 | 5590.00                 | 115.20   | 0.013500                            | -0.00                     | -0.00                        |
| 6.30         | 2/ 1      | 11460.00                 | 81                 | 7740.00          | 11320.00                 | 6780.00                 | 129.70   | 0.014500                            | -0.00                     | -0.00                        |
| 9.15         | 3/ 2      | 13060.00                 | 93                 | 8110.00          | 11580.00                 | 7840.00                 | 140.20   | 0.015500                            | -0.00                     | -0.00                        |
| 12.00        | 4/ 3      | 1080.00                  | 7                  | 3020.00          | 7350.00                  | 1070.00                 | 36.60    | 0.008100                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 68                       | 842.00                     | 9.30                      | 43.00         | 2.71                 | 0.0            | 50.00         | 3.00            | 53.00           | -0.00     | -0.00 | -0.00        |
| 81                       | 919.00                     | 11.50                     | 37.00         | 2.91                 | 0.0            | 67.00         | 3.00            | 70.00           | -0.00     | -0.00 | -0.00        |
| 93                       | 977.00                     | 13.40                     | 23.00         | 3.10                 | 0.0            | 83.00         | 5.00            | 88.00           | -0.00     | -0.00 | -0.00        |
| 7                        | 649.00                     | 0.70                      | 397.00        | 1.68                 | 110.00         | 9.00          | 5.00            | 14.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 68                       | 3.16                      | 0.0                       | 0.36                       | 3128.28                    | 6.03                      | 6.40                       | 17.66             | 0.0               | 2.02               | 17487.07           | 33.73             | 35.75              |
| 81                       | 2.93                      | 0.0                       | 0.34                       | 3129.26                    | 7.53                      | 7.87                       | 17.17             | 0.0               | 2.29               | 21216.40           | 51.07             | 53.35              |
| 93                       | 1.48                      | 0.0                       | 0.53                       | 3130.92                    | 8.76                      | 9.29                       | 11.59             | 0.0               | 4.14               | 24546.40           | 64.70             | 72.84              |
| 7                        | 45.74                     | 7.26                      | 0.95                       | 3041.46                    | 1.70                      | 2.65                       | 48.94             | 7.77              | 1.01               | 3254.36            | 1.82              | 2.84               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 68                       | 1.851          | 1833.026         | 0.0             | 3.536          | 0.212            | 3.748            |
| 81                       | 1.498          | 1851.344         | 0.0             | 4.456          | 0.200            | 4.656            |
| 93                       | 0.888          | 1879.510         | 0.0             | 5.261          | 0.317            | 5.578            |
| 7                        | 45.319         | 3013.293         | 7.197           | 1.688          | 0.938            | 2.625            |

REV 1/10/80

REV 1/10/80

REV 1/10/80

CAL IO NUMBER: 317 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: P6491858  
TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 52.051                    | 817.867               | 1.000              | 19.00                   | 16.483             | 258.99               | 63.642                | 266.00            | 0.06197            |
| TAKEOFF   | 1.000               | 14000.0       | 8.724                     | 8500.332              | 1.000              | 0.70                    | 0.102              | 99.17                | 1.026                 | 163.33            | 0.00062            |
| CLIMBOUT  | 0.850               | 11900.0       | 16.712                    | 7100.117              | 1.000              | 2.20                    | 0.613              | 260.34               | 2.354                 | 436.33            | 0.00140            |
| APPROACH  | 0.400               | 5600.0        | 16.477                    | 3417.406              | 1.000              | 4.00                    | 1.098              | 227.83               | 4.822                 | 373.33            | 0.00294            |
| TAXI-IDLE | 0.060               | 840.0         | 52.051                    | 817.867               | 1.000              | 7.00                    | 6.073              | 95.42                | 63.642                | 98.00             | 0.06197            |

TOTAL FOR CYCLE: 24.368 941.74 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 25.876  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 18.226  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.727

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 7.905                     | 817.867               | 1.000              | 19.00                   | 2.503              | 258.99               | 9.665                 | 266.00            | 0.00941            |
| TAKEOFF   | 1.000               | 14000.0       | 0.170                     | 8500.332              | 1.000              | 0.70                    | 0.002              | 99.17                | 0.020                 | 163.33            | 0.00001            |
| CLIMBOUT  | 0.850               | 11900.0       | 0.142                     | 7100.117              | 1.000              | 2.20                    | 0.005              | 260.34               | 0.020                 | 436.33            | 0.00001            |
| APPROACH  | 0.400               | 5600.0        | 0.243                     | 3417.406              | 1.000              | 4.00                    | 0.016              | 227.83               | 0.071                 | 373.33            | 0.00004            |
| TAXI-IDLE | 0.060               | 840.0         | 7.905                     | 817.867               | 1.000              | 7.00                    | 0.922              | 95.42                | 9.665                 | 98.00             | 0.00941            |

TOTAL FOR CYCLE: 3.449 941.74 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 3.662  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 2.579  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.142

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 2.007                     | 817.867               | 1.000              | 19.00                   | 0.635               | 258.99               | 2.454                 | 266.00            | 0.00239            |
| TAKEOFF   | 1.000               | 14000.0       | 90.146                    | 8500.332              | 1.000              | 0.70                    | 1.052               | 99.17                | 10.605                | 163.33            | 0.00644            |
| CLIMBOUT  | 0.850               | 11900.0       | 60.243                    | 7100.117              | 1.000              | 2.20                    | 2.209               | 260.34               | 8.485                 | 436.33            | 0.00506            |
| APPROACH  | 0.400               | 5600.0        | 15.679                    | 3417.406              | 1.000              | 4.00                    | 1.045               | 227.83               | 4.588                 | 373.33            | 0.00280            |
| TAXI-IDLE | 0.060               | 840.0         | 2.007                     | 817.867               | 1.000              | 7.00                    | 0.234               | 95.42                | 2.454                 | 98.00             | 0.00239            |

TOTAL FOR CYCLE: 5.175 941.74 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.496  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 3.871  
LBS POLLUTANT/1000K LB TH AT T.O.: 75.121

DATE: 8/ 5/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 318 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: P6491858

RATED THRUST: 14000.

ENGINE TOTAL TIME: 15745. HRS

TIME SINCE HOT SECTION OVERHAUL: 2685. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11945. HRS  
N2 COMPRESSOR OVERHAUL: 11945. HRS  
COMBUSTOR CAN REPLACEMENT: 2685. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 11945. HRS  
N1 TURBINE OVERHAUL: 11945. HRS  
N2 TURBINE OVERHAUL: 11945. HRS

FUEL: JP-4 TF FUEL W/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 69.00 FINISH 69.00

ATMOSPHERIC PRESSURE: START 29.11 FINISH 29.11

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0119

RELATIVE HUMIDITY: 66.00 PERCFNT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITFRS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

MO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE LAST OF THREE RUN ON THIS ENGINE. THE FUEL USED CONTAINED THE MINIMUM CONCENTRATION OF CI-2 (0.0125% BY VOLUME).

| FLAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9680.00                  | 69                 | 7300.00          | 11010.00                 | 5660.00                 | 116.70   | 0.013500                            | -0.00                     | -0.00                        |
| 3.35         | 2/ 1      | 11480.00                 | 81                 | 7730.00          | 1130.00                  | 6790.00                 | 129.70   | 0.014500                            | -0.00                     | -0.00                        |
| 6.00         | 3/ 2      | 12980.00                 | 92                 | 8090.00          | 11570.00                 | 7870.00                 | 140.40   | 0.015600                            | -0.00                     | -0.00                        |
| 9.00         | 4/ 3      | 10400.00                 | 7                  | 2990.00          | 7300.00                  | 1060.00                 | 35.70    | 0.008200                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO <sub>2</sub> (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO <sub>2</sub> (WET) PPMV | NO <sub>x</sub> (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------------------|----------------|---------------|----------------------------|----------------------------|-----------|-------|--------------|
| 69                       | 958.00                     | 9.80                      | 42.00         | 2.76                            | 0.0            | 54.00         | 3.00                       | 57.00                      | -0.00     | -0.00 | -0.00        |
| 81                       | 919.00                     | 11.50                     | 35.00         | 2.96                            | 0.0            | 69.00         | 5.00                       | 74.00                      | -0.00     | -0.00 | -0.00        |
| 92                       | 975.00                     | 13.40                     | 31.00         | 3.17                            | 0.0            | 86.00         | 4.00                       | 90.00                      | -0.00     | -0.00 | -0.00        |
| 7                        | 658.00                     | 0.70                      | 388.00        | 1.70                            | 80.00          | 7.00          | 9.00                       | 16.00                      | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO <sub>2</sub> LB/1K LB FUEL | MASS EMI CO <sub>2</sub> LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NO <sub>x</sub> LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO <sub>2</sub> LB/HR | MASS EMI CO <sub>2</sub> LB/HR | MASS EMI NO LB/HR | MASS EMI NO <sub>x</sub> LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------------------|----------------------------------------|---------------------------|----------------------------------------|-------------------|-------------------|--------------------------------|--------------------------------|-------------------|--------------------------------|
| 69                       | 3.03                      | 0.0                       | 0.36                                   | 3128.48                                | 6.40                      | 6.75                                   | 17.15             | 0.0               | 2.01                           | 17707.19                       | 36.22             | 38.23                          |
| 81                       | 2.36                      | 0.0                       | 0.55                                   | 3129.54                                | 7.63                      | 8.18                                   | 15.99             | 0.0               | 3.75                           | 21249.57                       | 51.76             | 55.54                          |
| 92                       | 1.95                      | 0.0                       | 0.41                                   | 3130.18                                | 8.88                      | 9.29                                   | 15.33             | 0.0               | 3.25                           | 24634.52                       | 69.87             | 73.12                          |
| 7                        | 44.29                     | 5.23                      | 1.69                                   | 3049.30                                | 1.31                      | 3.00                                   | 46.95             | 5.54              | 1.79                           | 3232.25                        | 1.39              | 3.18                           |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO <sub>2</sub> LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO <sub>2</sub> LB/1K#TH-HR | NO <sub>x</sub> LB/1K#TH-HR |
|--------------------------|----------------|-----------------------------|-----------------|----------------|-----------------------------|-----------------------------|
| 69                       | 1.772          | 1829.255                    | 0.0             | 3.741          | 0.208                       | 3.949                       |
| 81                       | 1.393          | 1851.008                    | 0.0             | 4.511          | 0.327                       | 4.838                       |
| 92                       | 1.181          | 1897.883                    | 0.0             | 5.383          | 0.250                       | 5.633                       |
| 7                        | 45.146         | 3107.938                    | 5.331           | 1.338          | 1.720                       | 3.058                       |

CAL ID NUMBER: 318 ENGINE TYPE AND MODEL: JT8D-1  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6491858

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 37.916                    | 750.110               | 1.000              | 19.00                   | 12.007             | 237.53               | 50.548                | 266.00            | 0.04514            |
| TAKEOFF   | 1.000               | 14000.0       | 13.041                    | 8619.195              | 1.000              | 0.70                    | 0.152              | 100.56               | 1.513                 | 163.33            | 0.00093            |
| CLIMBOUT  | 0.850               | 11900.0       | 15.219                    | 7198.500              | 1.000              | 2.20                    | 0.558              | 263.94               | 2.114                 | 436.33            | 0.00128            |
| APPROACH  | 0.400               | 5600.0        | 17.525                    | 3490.320              | 1.000              | 4.00                    | 1.168              | 232.69               | 5.021                 | 373.33            | 0.00313            |
| TAXI-IDLE | 0.060               | 840.0         | 37.916                    | 750.110               | 1.000              | 7.00                    | 4.424              | 87.51                | 50.548                | 98.00             | 0.04514            |

TOTAL FOR CYCLE: 18.309 922.24 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 19.853  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.694  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.087

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 6.098                     | 750.110               | 1.000              | 19.00                   | 1.931              | 237.53               | 8.130                 | 266.00            | 0.00726            |
| TAKEOFF   | 1.000               | 14000.0       | 0.181                     | 8619.195              | 1.000              | 0.70                    | 0.002              | 100.56               | 0.021                 | 163.33            | 0.00001            |
| CLIMBOUT  | 0.850               | 11900.0       | 0.059                     | 7198.500              | 1.000              | 2.20                    | 0.002              | 263.94               | 0.008                 | 436.33            | 0.00000            |
| APPROACH  | 0.400               | 5600.0        | 0.437                     | 3490.320              | 1.000              | 4.00                    | 0.029              | 232.69               | 0.125                 | 373.33            | 0.00008            |
| TAXI-IDLE | 0.060               | 840.0         | 6.098                     | 750.110               | 1.000              | 7.00                    | 0.711              | 87.51                | 8.130                 | 98.00             | 0.00726            |

TOTAL FOR CYCLE: 2.676 922.24 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.902  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 2.001  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.191

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 2.051                     | 750.110               | 1.000              | 19.00                   | 0.650               | 237.53               | 2.734                 | 266.00            | 0.00244            |
| TAKEOFF   | 1.000               | 14000.0       | 93.047                    | 8619.195              | 1.000              | 0.70                    | 1.086               | 100.56               | 10.795                | 163.33            | 0.00665            |
| CLIMBOUT  | 0.850               | 11900.0       | 61.150                    | 7198.500              | 1.000              | 2.20                    | 2.242               | 263.94               | 8.495                 | 436.33            | 0.00514            |
| APPROACH  | 0.400               | 5600.0        | 17.143                    | 3490.320              | 1.000              | 4.00                    | 1.143               | 232.69               | 4.912                 | 373.33            | 0.00306            |
| TAXI-IDLE | 0.060               | 840.0         | 2.051                     | 750.110               | 1.000              | 7.00                    | 0.239               | 87.51                | 2.734                 | 98.00             | 0.00244            |

TOTAL FOR CYCLE: 5.359 922.24 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.811  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.009  
LBS POLLUTANT/1000K LB TH AT T.O.: 77.539

DATE: 7/21/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMBER: 276 ENGINE TYPE AND MODEL: JT4D-7 SERIAL NUMBER: P6545648  
RATED THRUST: 14000.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 70.00

ATMOSPHERIC PRESSURE: START 28.98 FINISH 28.97

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0121

RELATIVE HUMIDITY: 58.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

NO2 DETERMINED BY SUBTRACTION.

| FLAPSFO<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9600.00                           | 68                       | 7210.00 10930.00                | 5550.00                           | 12.50                         | 0.013700    | -0.00                                        | 1.64                               | -0.00                                 |
| 4.30            | 2/ 1         | 11360.00                          | 81                       | 7610.00 11210.00                | 6626.00                           | 125.00                        | 0.014700    | -0.00                                        | 1.79                               | -0.00                                 |
| 11.00           | 3/ 2         | 13000.00                          | 92                       | 8000.00 11490.00                | 7720.00                           | 136.50                        | 0.015700    | -0.00                                        | 1.94                               | -0.00                                 |
| 20.30           | 4/ 3         | 10400.00                          | 7                        | 4140.00 7280.00                 | 1020.00                           | 36.50                         | 0.008000    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 68                                | 902.00                              | 9.20                               | 21.00               | 2.72                          | 1.00                 | 83.00               | 6.00                     | 89.00                    | -0.00     | -0.00 | -0.00        |
| 81                                | 960.00                              | 11.20                              | 17.00               | 2.93                          | 0.0                  | 104.00              | 6.00                     | 110.00                   | -0.00     | -0.00 | -0.00        |
| 92                                | 1020.00                             | 13.20                              | 11.00               | 3.12                          | 0.0                  | 121.00              | 2.00                     | 123.00                   | -0.00     | -0.00 | -0.00        |
| 7                                 | 696.00                              | 0.70                               | 302.00              | 1.61                          | 140.00               | 4.00                | 9.00                     | 13.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 68                                | 1.54                               | 0.04                               | 3.72                                | 3130.71                             | 9.99                               | 10.71                               | 8.54                    | 0.23                    | 4.01                     | 17375.43                 | 55.43                   | 59.43                    |
| 81                                | 1.16                               | 0.0                                | 0.67                                | 3131.42                             | 11.62                              | 12.29                               | 7.65                    | 0.0                     | 4.44                     | 20730.02                 | 76.92                   | 81.36                    |
| 92                                | 0.83                               | 0.0                                | 7.21                                | 3131.94                             | 12.70                              | 12.91                               | 6.41                    | 0.0                     | 1.62                     | 24178.54                 | 98.03                   | 99.65                    |
| 7                                 | 36.41                              | 9.67                               | 1.78                                | 3049.52                             | 0.79                               | 2.57                                | 37.13                   | 9.85                    | 1.82                     | 3110.51                  | 0.81                    | 2.63                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 68                                | 0.889             | 1809.941               | 0.024              | 5.774             | 0.417                  | 6.191                  |
| 81                                | 0.674             | 1824.826               | 0.0                | 6.771             | 0.391                  | 7.162                  |
| 92                                | 0.493             | 1859.888               | 0.0                | 7.540             | 0.125                  | 7.665                  |
| 7                                 | 35.706            | 2990.880               | 9.480              | 0.777             | 1.748                  | 2.525                  |

REV 10/19/80

CAL ID NUMBER: 276 ENGINE TYPE AND MODEL: JT8D-7

SERIAL NUMBER: P6545648

TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 31.726                    | 764.571               | 1.000              | 19.00                   | 10.047             | 242.11               | 41.495                | 266.00            | 0.03777            |
| TAKEDOFF                           | 1.000               | 14000.0       | 7.199                     | 8402.617              | 1.000              | 0.70                    | 0.084              | 98.03                | 0.857                 | 163.33            | 0.00051            |
| CLIMBOUT                           | 0.850               | 11900.0       | 8.193                     | 7077.039              | 1.000              | 2.20                    | 0.300              | 259.49               | 1.158                 | 436.33            | 0.00069            |
| APPROACH                           | 0.400               | 5600.0        | 16.576                    | 3102.496              | 1.000              | 4.00                    | 1.105              | 206.83               | 5.343                 | 373.33            | 0.00296            |
| TAXI-IDLE                          | 0.060               | 840.0         | 31.726                    | 764.571               | 1.000              | 7.00                    | 3.701              | 89.20                | 41.495                | 98.00             | 0.03777            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.238             | 895.67               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 17.012             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.397             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.600              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 11.451                    | 764.571               | 1.000              | 19.00                   | 3.626              | 242.11               | 14.977                | 266.00            | 0.01363            |
| TAKEDOFF                           | 1.000               | 14000.0       | 0.0                       | 8402.617              | 1.000              | 0.70                    | 0.0                | 98.03                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.130                     | 7077.039              | 1.000              | 2.20                    | 0.005              | 259.49               | 0.018                 | 436.33            | 0.00001            |
| APPROACH                           | 0.400               | 5600.0        | 0.418                     | 3102.496              | 1.000              | 4.00                    | 0.028              | 206.83               | 0.135                 | 373.33            | 0.00007            |
| TAXI-IDLE                          | 0.060               | 840.0         | 11.451                    | 764.571               | 1.000              | 7.00                    | 1.336              | 89.20                | 14.977                | 98.00             | 0.01363            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.995              | 895.67               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.576              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.736              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.365                     | 764.571               | 1.000              | 19.00                   | 0.432               | 242.11               | 1.785                 | 266.00            | 0.00162            |
| TAKEDOFF                           | 1.000               | 14000.0       | 111.885                   | 8402.617              | 1.000              | 0.70                    | 1.305               | 98.03                | 13.315                | 163.33            | 0.00799            |
| CLIMBOUT                           | 0.850               | 11900.0       | 88.172                    | 7077.039              | 1.000              | 2.20                    | 3.233               | 259.49               | 12.459                | 436.33            | 0.00741            |
| APPROACH                           | 0.400               | 5600.0        | 22.662                    | 3102.496              | 1.000              | 4.00                    | 1.511               | 206.83               | 7.305                 | 373.33            | 0.00405            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.365                     | 764.571               | 1.000              | 7.00                    | 0.159               | 89.20                | 1.785                 | 98.00             | 0.00162            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.640               | 895.67               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.414               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.967               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 93.237              |                      |                       |                   |                    |

REV 10/19/80

REV 10/19/80

DATE: 7/28/71

TEST ORGANIZATION: S M R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 285 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: P6540748

RATED THRUST: 14000.

ENGINE TOTAL TIME: 8438. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8438. HRS

N2 COMPRESSOR OVERHAUL: 8438. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 8438. HRS

N2 TURBINE OVERHAUL: 8438. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 76.00

ATMOSPHERIC PRESSURE: START 28.95 FINISH 28.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0090

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

IDLE MODE DATA FOR THE JT8D WERE NORMALLY MEASURED WITH A SINGLE, AXIAL PROBE TO PREVENT DILUTION PROBLEMS (DUE TO EXHAUST PIPE MIXING). FOR THIS TEST A FULL-SIZE PROBE WAS USED AND A CORRECTION FACTOR WAS APPLIED TO RUN #4 CONCENTRATIONS AS CALCULATED FROM A CARBON BALANCE. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2      | MEASURED FUEL FLOW LB/HR | GAS FLOW AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|----------|---------|--------------------------|--------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9560.00                  | 68                 | 7210.00          | 10980.00 | 5620.00 | 114.30                   | 0.013700                 | -0.00    | 1.65                                | -0.00                     |                              |
| 6.00         | 2/ 1      | 11460.00                 | 81                 | 7630.00          | 11280.00 | 6750.00 | 128.50                   | 0.014600                 | -0.00    | 1.80                                | -0.00                     |                              |
| 12.00        | 3/ 2      | 12880.00                 | 91                 | 7960.00          | 11580.00 | 7690.00 | 138.50                   | 0.015400                 | -0.00    | 1.94                                | -0.00                     |                              |
| 16.00        | 4/ 3      | 880.00                   | 6                  | 2670.00          | 6910.00  | 880.00  | 32.80                    | 0.007500                 | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 68                       | 919.00                     | 9.10                      | 17.00         | 2.72                 | 5.00           | 57.00         | 3.00            | 60.00           | -0.00     | -0.00 | -0.00        |
| 81                       | 979.00                     | 11.40                     | 11.00         | 2.95                 | 1.00           | 75.00         | 4.00            | 79.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 1033.00                    | 13.10                     | 8.00          | 3.05                 | 0.0            | 95.00         | 5.00            | 100.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 702.00                     | 0.50                      | 231.00        | 1.54                 | 97.00          | 5.00          | 6.00            | 11.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 68                       | 1.25                      | 0.21                      | 0.36                       | 3130.71                    | 6.86                      | 7.22                       | 7.00              | 1.18              | 2.03               | 17594.59           | 38.54             | 40.57              |
| 81                       | 0.74                      | 0.04                      | 0.44                       | 3131.97                    | 8.32                      | 8.77                       | 5.02              | 0.26              | 3.00               | 21140.78           | 56.19             | 59.18              |
| 91                       | 0.52                      | 0.0                       | 0.54                       | 3132.42                    | 10.20                     | 10.74                      | 4.02              | 0.0               | 4.13               | 24088.31           | 78.44             | 82.56              |
| 6                        | 29.29                     | 7.04                      | 1.25                       | 3067.90                    | 1.04                      | 2.29                       | 25.77             | 6.20              | 1.10               | 2699.75            | 0.92              | 2.02               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 68                       | 0.732          | 1840.438         | 0.123           | 4.032          | 0.212            | 4.244            |
| 81                       | 0.438          | 1844.745         | 0.023           | 4.903          | 0.261            | 5.164            |
| 91                       | 0.312          | 1870.210         | 0.0             | 6.090          | 0.321            | 6.410            |
| 6                        | 29.288         | 3067.900         | 7.044           | 1.041          | 1.250            | 2.291            |

CAL ID NUMBER: 285 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: P6540748  
TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 22.619                    | 741.444               | 1.000              | 19.00                   | 7.163              | 234.79               | 30.507                | 266.00            | 0.02693            |
| TAKEOFF   | 1.000               | 14000.0       | 2.927                     | 8321.195              | 1.000              | 0.70                    | 0.034              | 97.08                | 0.352                 | 163.33            | 0.00021            |
| CLIMBOUT  | 0.850               | 11900.0       | 4.588                     | 7053.270              | 1.000              | 2.20                    | 0.168              | 258.62               | 0.650                 | 436.33            | 0.00039            |
| APPROACH  | 0.400               | 5600.0        | 17.878                    | 3690.958              | 1.000              | 4.00                    | 1.192              | 246.06               | 4.844                 | 373.33            | 0.00319            |
| TAXI-IDLE | 0.060               | 840.0         | 22.619                    | 741.444               | 1.000              | 7.00                    | 2.639              | 86.50                | 30.507                | 98.00             | 0.02693            |

TOTAL FOR CYCLE: 11.196 923.06 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 12.129  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.374  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.244

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 5.450                     | 741.444               | 1.000              | 19.00                   | 1.726              | 234.79               | 7.351                 | 266.00            | 0.00649            |
| TAKEOFF   | 1.000               | 14000.0       | 0.0                       | 8321.195              | 1.000              | 0.70                    | 0.0                | 97.08                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT  | 0.850               | 11900.0       | 0.0                       | 7053.270              | 1.000              | 2.20                    | 0.0                | 258.62               | 0.0                   | 436.33            | 0.0                |
| APPROACH  | 0.400               | 5600.0        | 4.188                     | 3690.958              | 1.000              | 4.00                    | 0.279              | 246.06               | 1.135                 | 373.33            | 0.00075            |
| TAXI-IDLE | 0.060               | 840.0         | 5.450                     | 741.444               | 1.000              | 7.00                    | 0.636              | 86.50                | 7.351                 | 98.00             | 0.00649            |

TOTAL FOR CYCLE: 2.641 923.06 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.861  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.975  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 1.496                     | 741.444               | 1.000              | 19.00                   | 0.474               | 234.79               | 2.017                 | 266.00            | 0.00178            |
| TAKEOFF   | 1.000               | 14000.0       | 114.401                   | 8321.195              | 1.000              | 0.70                    | 1.335               | 97.08                | 13.748                | 163.33            | 0.00817            |
| CLIMBOUT  | 0.850               | 11900.0       | 66.817                    | 7053.270              | 1.000              | 2.20                    | 2.450               | 258.62               | 9.473                 | 436.33            | 0.00561            |
| APPROACH  | 0.400               | 5600.0        | 17.484                    | 3690.958              | 1.000              | 4.00                    | 1.166               | 246.06               | 4.737                 | 373.33            | 0.00312            |
| TAXI-IDLE | 0.060               | 840.0         | 1.496                     | 741.444               | 1.000              | 7.00                    | 0.175               | 86.50                | 2.017                 | 98.00             | 0.00178            |

TOTAL FOR CYCLE: 5.598 923.06 1337.00  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.065  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.187  
LBS POLLUTANT/1000K LB TH AT T.O.: 95.334

DATE: 7/12/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 110 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBR: P6652448  
 RATED THRUST: 14500.  
 ENGINE TOTAL TIME: 6144. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 6144. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 6144. HRS  
 N2 COMPRESSOR OVERHAUL: 6144. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 6144. HRS  
 N1 TURBINE OVERHAUL: 6144. HRS  
 N2 TURBINE OVERHAUL: 6144. HRS  
 FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 80.00  
 ATMOSPHERIC PRESSURE: START 28.81 FINISH 28.81  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0171  
 RELATIVE HUMIDITY: 72.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

ENGINE EQUIPPED WITH SMOKELESS BURNER CANS

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2 | MEASURED FUEL FLOW LB/HR | GAS FLOW AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|----------|----|--------------------------|--------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1.00         | 1/ 0      | 9420.00                  | 64                 | 7220.00          | 11100.00 |    | 5400.00                  | 114.60                   | 0.013100 | -0.00                               | 1.65                      | -0.00                        |
| 15.10        | 2/ 1      | 11900.00                 | 82                 | 7740.00          | 11460.00 |    | 6960.00                  | 132.50                   | 0.014600 | -0.00                               | 1.86                      | -0.00                        |
| 26.30        | 3/ 2      | 13690.00                 | 94                 | 8120.00          | 11630.00 |    | 8210.00                  | 145.70                   | 0.015700 | -0.00                               | 2.03                      | -0.00                        |
| 31.00        | 4/ 3      | 990.00                   | 6                  | 4980.00          | 7110.00  |    | 1230.00                  | 43.20                    | 0.007900 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 64                       | 921.00                     | 9.00                      | 11.00         | 2.32                 | 3.00           | 61.00         | 3.00            | 64.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 992.00                     | 12.00                     | 14.00         | 2.75                 | 2.00           | 94.00         | 5.00            | 99.00           | -0.00     | -0.00 | -0.00        |
| 94                       | 1065.00                    | 14.40                     | 12.00         | 3.05                 | 1.00           | 124.00        | 8.00            | 132.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 694.00                     | 0.60                      | 161.00        | 1.67                 | 50.00          | 3.00          | 5.00            | 8.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 64                       | 0.94                      | 0.15                      | 0.42                       | 3131.35                    | 8.61                      | 9.03                       | 5.10              | 0.80              | 2.29               | 16909.30           | 46.48             | 48.76              |
| 82                       | 1.01                      | 0.08                      | 0.60                       | 3131.42                    | 11.19                     | 11.78                      | 7.04              | 0.58              | 4.14               | 21794.68           | 77.88             | 87.02              |
| 94                       | 0.78                      | 0.04                      | 0.85                       | 3131.91                    | 13.31                     | 14.17                      | 6.44              | 0.31              | 7.05               | 25712.95           | 109.28            | 116.33             |
| 6                        | 18.99                     | 3.38                      | 0.97                       | 3094.15                    | 0.58                      | 1.55                       | 23.35             | 4.15              | 1.19               | 3805.80            | 0.71              | 1.91               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 64                       | 0.542          | 1775.042         | 0.085           | 4.934          | 0.243            | 5.177            |
| 82                       | 0.593          | 1831.485         | 0.049           | 6.545          | 0.348            | 6.893            |
| 94                       | 0.470          | 1878.229         | 0.022           | 7.983          | 0.515            | 8.498            |
| 6                        | 23.587         | 1844.245         | 4.105           | 0.722          | 1.203            | 1.925            |

REV 10/20/00

CAL ID NUMBER: 110 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P6652448

TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 58.225                    | 1015.298              | 1.000              | 19.00                   | 18.438             | 321.51               | 57.348                | 275.50            | 0.06693            |
| TAKEOFF   | 1.000               | 14500.0       | 6.633                     | 9006.500              | 1.000              | 0.70                    | 0.077              | 105.08               | 0.736                 | 169.17            | 0.00046            |
| CLIMBOUT  | 0.850               | 12325.0       | 7.094                     | 7098.297              | 1.000              | 2.20                    | 0.260              | 260.27               | 0.999                 | 451.92            | 0.00058            |
| APPROACH  | 0.400               | 5800.0        | 3.360                     | 3854.013              | 1.000              | 4.00                    | 0.224              | 256.93               | 0.872                 | 386.67            | 0.00058            |
| TAXI-IDLE | 0.060               | 870.0         | 58.225                    | 1015.298              | 1.000              | 7.00                    | 6.793              | 118.45               | 57.348                | 101.50            | 0.06693            |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 25.792  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 24.281  
 LBS POLLUTANT/1000K LB TH AT T.O.: 18.626  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.534

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 29.431                    | 1015.298              | 1.000              | 19.00                   | 9.320              | 321.51               | 28.988                | 275.50            | 0.03383            |
| TAKEOFF   | 1.000               | 14500.0       | 0.076                     | 9006.500              | 1.000              | 0.70                    | 0.001              | 105.08               | 0.008                 | 169.17            | 0.00001            |
| CLIMBOUT  | 0.850               | 12325.0       | 0.473                     | 7098.297              | 1.000              | 2.20                    | 0.017              | 260.27               | 0.067                 | 451.92            | 0.00004            |
| APPROACH  | 0.400               | 5800.0        | 0.657                     | 3854.013              | 1.000              | 4.00                    | 0.044              | 256.93               | 0.171                 | 386.67            | 0.00011            |
| TAXI-IDLE | 0.060               | 870.0         | 29.431                    | 1015.298              | 1.000              | 7.00                    | 3.434              | 118.45               | 28.988                | 101.50            | 0.03383            |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 12.816  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 12.065  
 LBS POLLUTANT/1K LB TH AT T.O.: 9.255  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.061

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 1.389                     | 1015.298              | 1.000              | 19.00                   | 0.440               | 321.51               | 1.368                 | 275.50            | 0.00160            |
| TAKEOFF   | 1.000               | 14500.0       | 136.096                   | 9006.500              | 1.000              | 0.70                    | 1.588               | 105.08               | 15.111                | 169.17            | 0.00939            |
| CLIMBOUT  | 0.850               | 12325.0       | 87.427                    | 7098.297              | 1.000              | 2.20                    | 3.206               | 260.27               | 12.317                | 451.92            | 0.00709            |
| APPROACH  | 0.400               | 5800.0        | 22.224                    | 3854.013              | 1.000              | 4.00                    | 1.482               | 256.93               | 5.767                 | 386.67            | 0.00383            |
| TAXI-IDLE | 0.060               | 870.0         | 1.389                     | 1015.298              | 1.000              | 7.00                    | 0.162               | 118.45               | 1.368                 | 101.50            | 0.00160            |

TOTAL FOR CYCLE:  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 6.877  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.474  
 LBS POLLUTANT/1K LB TH AT T.O.: 4.966  
 LBS POLLUTANT/1000K LB TH AT T.O.: 109.503

REV 10/20/00

REV 10/20/00

DATE: 7/14/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 112 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P665338B  
 RATED THRUST: 14500.  
 ENGINE TOTAL TIME: 5839. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 3343. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 5839. HRS  
 N2 COMPRESSOR OVERHAUL: 5839. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3343. HRS  
 N1 TURBINE OVERHAUL: 5839. HRS  
 N2 TURBINE OVERHAUL: 5839. HRS  
 FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 70.00 FINISH 75.00  
 ATMOSPHERIC PRESSURE: START 28.92 FINISH 28.92  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0131  
 RELATIVE HUMIDITY: 74.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|---------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9350.00            | 64                  | 7110.00          | 10830.00                 | 5350.00                 | 0.012900 | -0.00                               | 1.64                      | -0.00                        |
| 11.00        | 2/ 1      | 11320.00           | 79                  | 7520.00          | 11240.00                 | 6520.00                 | 0.013400 | -0.00                               | 1.82                      | -0.00                        |
| 26.00        | 3/ 2      | 13740.00           | 94                  | 8090.00          | 11630.00                 | 8250.00                 | 0.015600 | -0.00                               | 2.04                      | -0.00                        |
| 31.30        | 4/ 3      | 840.00             | 5                   | 2610.00          | 6870.00                  | 1010.00                 | 0.007900 | -0.00                               | -0.00                     | -0.00                        |
| 38.30        | 5/ 4      | 13320.00           | 91                  | 7940.00          | 11590.00                 | 7800.00                 | 0.015000 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 64                       | 861.00                     | 9.10                      | 6.00          | 1.99                 | 1.00           | 63.00         | 6.00            | 69.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 926.00                     | 11.30                     | 12.00         | 2.13                 | 0.0            | 85.00         | 6.00            | 91.00           | -0.00     | -0.00 | -0.00        |
| 94                       | 1017.00                    | 14.80                     | 9.00          | 2.18                 | 0.0            | 121.00        | 7.00            | 128.00          | -0.00     | -0.00 | -0.00        |
| 5                        | 659.00                     | 0.50                      | 260.00        | 1.57                 | 80.00          | 3.00          | 9.00            | 12.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 1012.00                    | 14.20                     | 12.00         | 2.36                 | 2.00           | 111.00        | 6.00            | 117.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 64                       | 0.50                      | 0.04                      | 0.49                       | 3132.14                    | 10.37                     | 11.35                      | 3.22              | 0.31              | 5.28               | 16756.95           | 35.46             | 60.74              |
| 78                       | 1.12                      | 0.0                       | 0.92                       | 3131.48                    | 13.06                     | 13.99                      | 7.32              | 0.0               | 6.01               | 20417.21           | 85.18             | 91.19              |
| 94                       | 0.75                      | 0.0                       | 0.96                       | 3132.06                    | 16.65                     | 17.61                      | 6.22              | 0.0               | 7.94               | 25839.47           | 137.33            | 145.28             |
| 5                        | 32.32                     | 5.70                      | 1.84                       | 3066.83                    | 0.61                      | 2.45                       | 32.65             | 5.75              | 1.86               | 3097.49            | 0.62              | 2.47               |
| 91                       | 1.01                      | 0.10                      | 0.83                       | 3131.39                    | 15.40                     | 16.23                      | 7.70              | 0.75              | 6.49               | 24424.80           | 120.09            | 126.59             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 64                       | 0.344          | 1792.197         | 0.033           | 5.931          | 0.565            | 6.496            |
| 78                       | 0.647          | 1833.641         | 0.0             | 7.524          | 0.531            | 8.056            |
| 94                       | 0.453          | 1980.602         | 0.0             | 9.905          | 0.578            | 10.573           |
| 5                        | 38.866         | 3687.493         | 6.845           | 0.717          | 2.710            | 2.946            |
| 91                       | 0.593          | 1933.694         | 0.057           | 9.016          | 0.487            | 9.503            |

100

CAL ID NUMBER: 112 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6653388  
TEST ORGANIZATION: S M R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-MR | LB CO /<br># TH-MR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 33.973                    | 1052.542              | 1.000              | 19.00                   | 10.758             | 333.30               | 32.277                | 275.50            | 0.03905            |
| TAKEOFF                            | 1.000               | 14500.0       | 2.290                     | 8850.086              | 1.000              | 0.70                    | 0.027              | 103.25               | 0.259                 | 169.17            | 0.00016            |
| CLIMBOUT                           | 0.850               | 12325.0       | 8.284                     | 7225.609              | 1.000              | 2.20                    | 0.304              | 264.94               | 1.146                 | 451.92            | 0.00067            |
| APPROACH                           | 0.400               | 5800.0        | 2.076                     | 3802.475              | 1.000              | 4.00                    | 0.138              | 253.50               | 0.546                 | 386.67            | 0.00036            |
| TAXI-IDLE                          | 0.060               | 870.0         | 33.973                    | 1052.542              | 1.000              | 7.00                    | 3.964              | 122.80               | 32.277                | 101.50            | 0.03905            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.190             | 1077.79              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 14.094             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-MR/CYCLE:   |                     |               |                           |                       |                    |                         | 10.970             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.184              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 7.929                     | 1052.542              | 1.000              | 19.00                   | 2.511              | 333.30               | 7.533                 | 275.50            | 0.00911            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.0                       | 8850.086              | 1.000              | 0.70                    | 0.0                | 103.25               | 0.0                   | 169.17            | 0.0                |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.0                       | 7225.609              | 1.000              | 2.20                    | 0.0                | 264.94               | 0.0                   | 451.92            | 0.0                |
| APPROACH                           | 0.400               | 5800.0        | 0.167                     | 3802.475              | 1.000              | 4.00                    | 0.011              | 253.50               | 0.044                 | 386.67            | 0.00003            |
| TAXI-IDLE                          | 0.060               | 870.0         | 7.929                     | 1052.542              | 1.000              | 7.00                    | 0.925              | 122.80               | 7.533                 | 101.50            | 0.00911            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.447              | 1077.79              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.198              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.489              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.467                     | 1052.542              | 1.000              | 19.00                   | 0.781               | 333.30               | 2.344                 | 275.50            | 0.00284            |
| TAKEOFF                            | 1.000               | 14500.0       | 188.728                   | 8850.086              | 1.000              | 0.70                    | 2.202               | 103.25               | 21.325                | 169.17            | 0.01302            |
| CLIMBOUT                           | 0.850               | 12325.0       | 107.472                   | 7225.609              | 1.000              | 2.20                    | 3.941               | 264.94               | 14.874                | 451.92            | 0.00872            |
| APPROACH                           | 0.400               | 5800.0        | 27.671                    | 3802.475              | 1.000              | 4.00                    | 1.845               | 253.50               | 7.277                 | 386.67            | 0.00477            |
| TAXI-TOLE                          | 0.060               | 870.0         | 2.467                     | 1052.542              | 1.000              | 7.00                    | 0.288               | 122.80               | 2.344                 | 101.50            | 0.00284            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.056               | 1077.79              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 8.403               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.540               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 151.850             |                      |                       |                   |                    |

DATE: 7/16/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMRFR: 114 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P665244B  
RATED THRUST: 14500.

ENGINE TOTAL TIME: 6144. HRS

TIME SINCE HOT SECTION OVERHAUL: 6144. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 6144. HRS  
N2 COMPRESSOR OVERHAUL: 6144. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANF OVERHAUL: 6144. HRS  
N1 TURBINE OVERHAUL: 6144. HRS  
N2 TURBINE OVERHAUL: 6144. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.070

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPRATURE, DEGREES F: START 80.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 28.94 FINISH 28.94

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0133

RELATIVE HUMIDITY: 56.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | THRUST, LBS<br>OR<br>SHP | POWER PERCENT<br>RATED<br>T.O. | ENGINE SPEED<br>RPM<br>N1 N2 | MEASURED FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|--------------|-----------|--------------------------|--------------------------------|------------------------------|--------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0          | 1/ 0      | 9580.00                  | 66                             | 7200.00 10810.00             | 5680.00                        | 116.10                        | 0.013600    | -0.00                                        | -0.00                              | -0.00                                 |
| 3.00         | 2/ 1      | 11340.00                 | 78                             | 7580.00 11160.00             | 6640.00                        | 129.00                        | 0.014300    | -0.00                                        | -0.00                              | -0.00                                 |
| 11.00        | 3/ 2      | 13540.00                 | 93                             | 8110.00 11550.00             | 8190.00                        | 145.00                        | 0.015700    | -0.00                                        | -0.00                              | -0.00                                 |
| 19.00        | 4/ 3      | 760.00                   | 5                              | 2570.00 6630.00              | 880.00                         | 28.80                         | 0.008500    | -0.00                                        | -0.00                              | -0.00                                 |
| 31.00        | 5/ 4      | 13680.00                 | 94                             | 8120.00 11580.00             | 8350.00                        | 146.00                        | 0.015900    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>?<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 66                                | 905.00                              | 9.10                               | 13.00               | 2.38                          | 0.0                  | 70.00               | 4.00                     | 74.00                    | -0.00     | -0.00 | -0.00        |
| 78                                | 966.00                              | 11.20                              | 14.00               | 2.42                          | 0.0                  | 89.00               | 4.00                     | 93.00                    | -0.00     | -0.00 | -0.00        |
| 93                                | 1070.00                             | 14.20                              | 12.00               | 2.63                          | 0.0                  | 120.00              | 7.00                     | 127.00                   | -0.00     | -0.00 | -0.00        |
| 5                                 | 671.00                              | 0.50                               | 333.00              | 1.67                          | 146.00               | 3.00                | 9.00                     | 12.00                    | -0.00     | -0.00 | -0.00        |
| 94                                | 1053.00                             | 14.30                              | 13.00               | 2.69                          | 0.0                  | 122.00              | 5.00                     | 127.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/1K<br>LB FUEL | MASS FMI<br>HC<br>LB/1K<br>LB FUEL | MASS FMI<br>NO2<br>LB/1K<br>LB FUEL | MASS FMI<br>CO2<br>LB/1K<br>LB FUEL | MASS FMI<br>NO<br>LB/1K<br>LB FUEL | MASS FMI<br>NOX<br>LB/1K<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 66                                | 1.09                               | 0.0                                | 0.55                                | 3131.53                             | 9.63                               | 10.19                               | 6.18                    | 0.0                     | 3.13                     | 17787.08                 | 54.69                   | 57.87                    |
| 78                                | 1.15                               | 0.0                                | 0.54                                | 3131.43                             | 12.04                              | 12.58                               | 7.66                    | 0.0                     | 3.59                     | 20792.69                 | 79.94                   | 83.53                    |
| 93                                | 0.91                               | 0.0                                | 0.87                                | 3131.91                             | 14.94                              | 15.81                               | 7.45                    | 0.0                     | 7.14                     | 25649.53                 | 122.35                  | 129.48                   |
| 5                                 | 38.55                              | 9.71                               | 1.72                                | 3045.98                             | 0.57                               | 2.29                                | 34.02                   | 8.54                    | 1.51                     | 2680.37                  | 0.50                    | 2.01                     |
| 94                                | 0.96                               | 0.0                                | 0.61                                | 3131.73                             | 14.85                              | 15.46                               | 8.04                    | 0.0                     | 5.08                     | 26149.91                 | 123.98                  | 129.06                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>?<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 66                                | 0.645             | 1856.489               | 0.0                | 5.709             | 0.376                  | 6.035                  |
| 78                                | 0.475             | 1833.571               | 0.0                | 7.049             | 0.317                  | 7.366                  |
| 93                                | 0.550             | 1894.352               | 0.0                | 9.036             | 0.527                  | 9.563                  |
| 5                                 | 44.759            | 3526.406               | 11.239             | 0.662             | 1.987                  | 2.649                  |
| 94                                | 0.599             | 1911.543               | 0.0                | 9.063             | 0.371                  | 9.434                  |

CAL IO NUMBER: 114 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6652448

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 32.774                    | 922.494               | 1.000              | 19.00                   | 10.379             | 292.12               | 35.528                | 275.50            | 0.03767            |
| TAKEOFF   | 1.000               | 14500.0       | 7.734                     | 9035.027              | 1.000              | 0.70                    | 0.090              | 105.41               | 0.856                 | 169.17            | 0.00053            |
| CLIMBOUT  | 0.850               | 12325.0       | 6.439                     | 7522.078              | 1.000              | 2.20                    | 0.236              | 275.81               | 0.856                 | 451.92            | 0.00052            |
| APPROACH  | 0.400               | 5800.0        | 4.421                     | 3780.560              | 1.000              | 4.00                    | 0.295              | 252.04               | 1.169                 | 386.67            | 0.00076            |
| TAXI-IDLE | 0.060               | 870.0         | 32.774                    | 922.494               | 1.000              | 7.00                    | 3.824              | 107.62               | 35.528                | 101.50            | 0.03767            |

TOTAL FOR CYCLE: 14.823 1033.00 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 14.350  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 10.705  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.622

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 4.289                     | 922.494               | 1.000              | 19.00                   | 1.358              | 292.12               | 4.649                 | 275.50            | 0.00493            |
| TAKEOFF   | 1.000               | 14500.0       | 0.0                       | 9035.027              | 1.000              | 0.70                    | 0.0                | 105.41               | 0.0                   | 169.17            | 0.0                |
| CLIMBOUT  | 0.850               | 12325.0       | 0.0                       | 7522.078              | 1.000              | 2.20                    | 0.0                | 275.81               | 0.0                   | 451.92            | 0.0                |
| APPROACH  | 0.400               | 5800.0        | 0.153                     | 3780.560              | 1.000              | 4.00                    | 0.010              | 252.04               | 0.041                 | 386.67            | 0.00003            |
| TAXI-IDLE | 0.060               | 870.0         | 4.289                     | 922.494               | 1.000              | 7.00                    | 0.500              | 107.62               | 4.649                 | 101.50            | 0.00493            |

TOTAL FOR CYCLE: 1.869 1033.00 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 1.809  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.350  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 2.128                     | 922.494               | 1.000              | 19.00                   | 0.674               | 292.12               | 2.306                 | 275.50            | 0.00245            |
| TAKEOFF   | 1.000               | 14500.0       | 150.332                   | 9035.027              | 1.000              | 0.70                    | 1.754               | 105.41               | 16.639                | 169.17            | 0.01037            |
| CLIMBOUT  | 0.850               | 12325.0       | 103.709                   | 7522.078              | 1.000              | 2.20                    | 3.803               | 275.81               | 13.787                | 451.92            | 0.00841            |
| APPROACH  | 0.400               | 5800.0        | 24.128                    | 3780.560              | 1.000              | 4.00                    | 1.609               | 252.04               | 6.382                 | 386.67            | 0.00416            |
| TAXI-IDLE | 0.060               | 870.0         | 2.128                     | 922.494               | 1.000              | 7.00                    | 0.248               | 107.62               | 2.306                 | 101.50            | 0.00245            |

TOTAL FOR CYCLE: 8.087 1033.00 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 7.829  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.840  
LBS POLLUTANT/1000K LB TH AT T.O.: 120.956

DATE: 7/15/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMBER: 275 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6653368

RATED THRUST: 14500.

ENGINE TOTAL TIME: 5923. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 5923. HRS  
N2 COMPRESSOR OVERHAUL: 5923. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 5923. HRS  
N2 TURBINE OVERHAUL: 5923. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 28.88 FINISH 28.88

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0123

RELATIVE HUMIDITY: 53.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00; FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NUZ DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9500.00                           | 65                       | 7330.00 10930.00                | 5600.00                           | 114.20                        | 0.014000    | -0.00                                        | 1.65                               | -0.00                                 |
| 15.00           | 2/ 1         | 11850.00                          | 81                       | 7730.00 11370.00                | 7000.00                           | 132.10                        | 0.014700    | -0.00                                        | 1.86                               | -0.00                                 |
| 32.00           | 3/ 2         | 13500.00                          | 93                       | 8120.00 11620.00                | 8160.00                           | 144.40                        | 0.015700    | -0.00                                        | 2.01                               | -0.00                                 |
| 37.00           | 4/ 3         | 920.00                            | 6                        | 2750.00 7020.00                 | 930.00                            | 32.60                         | 0.007900    | -0.00                                        | -0.00                              | -0.00                                 |
| 42.00           | 5/ 4         | 12750.00                          | 87                       | 7900.00 11450.00                | 7700.00                           | 138.70                        | 0.015400    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 910.00                              | 9.10                               | 11.00               | 2.83                          | 10.00                | 70.00               | 5.00                     | 75.00                    | -0.00     | -0.00 | -0.00        |
| 81                                | 985.00                              | 12.00                              | 8.00                | 2.97                          | 10.00                | 100.00              | 6.00                     | 106.00                   | -0.00     | -0.00 | -0.00        |
| 93                                | 1046.00                             | 14.20                              | 6.00                | 3.15                          | 10.00                | 175.00              | 6.00                     | 131.00                   | -0.00     | -0.00 | -0.00        |
| 6                                 | 680.00                              | 0.60                               | 269.00              | 1.61                          | 80.00                | 5.00                | 7.00                     | 12.00                    | -0.00     | -0.00 | -0.00        |
| 87                                | 1017.00                             | 13.10                              | 7.00                | 3.10                          | 14.00                | 108.00              | 5.00                     | 113.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 65                                | 0.77                               | 0.40                               | 0.58                                | 3130.97                             | 8.10                               | 8.67                                | 4.34                    | 2.26                    | 3.24                     | 17533.14                 | 45.34                   | 48.58                    |
| 81                                | 0.54                               | 0.38                               | 0.66                                | 3131.34                             | 11.02                              | 11.68                               | 3.76                    | 2.69                    | 4.63                     | 21919.41                 | 77.15                   | 81.78                    |
| 93                                | 0.38                               | 0.36                               | 0.67                                | 3131.65                             | 12.99                              | 13.61                               | 3.10                    | 2.96                    | 5.09                     | 25554.26                 | 106.01                  | 111.10                   |
| 6                                 | 32.61                              | 5.55                               | 1.34                                | 3066.77                             | 1.00                               | 2.39                                | 30.33                   | 5.17                    | 1.30                     | 2852.09                  | 0.93                    | 2.22                     |
| 87                                | 0.45                               | 0.52                               | 0.53                                | 3131.12                             | 11.40                              | 11.93                               | 3.46                    | 3.97                    | 4.07                     | 24109.62                 | 87.81                   | 91.87                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 0.457             | 1945.594               | 0.238              | 4.772             | 0.341                  | 5.113                  |
| 81                                | 0.117             | 1849.739               | 0.227              | 6.511             | 0.391                  | 6.901                  |
| 93                                | 0.229             | 1892.408               | 0.219              | 7.853             | 0.377                  | 8.229                  |
| 6                                 | 32.966            | 3100.100               | 5.615              | 1.006             | 1.409                  | 2.416                  |
| 87                                | 0.272             | 1990.950               | 0.311              | 6.887             | 0.319                  | 7.206                  |

FORM 100-10-1

FORM 100-10-1

CAL ID NUMBER: 275 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P6653368

TEST ORGANIZATION: S W R I TWA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 29.587                    | 783.840               | 1.000              | 19.00                   | 9.369              | 248.22               | 37.746                | 275.50            | 0.03401            |
| TAKEOFF   | 1.000               | 14500.0       | 2.419                     | 8639.344              | 1.000              | 0.70                    | 0.028              | 100.79               | 0.280                 | 169.17            | 0.00017            |
| CLIMBOUT  | 0.850               | 12325.0       | 2.917                     | 7472.914              | 1.000              | 2.20                    | 0.107              | 274.01               | 0.390                 | 451.92            | 0.00024            |
| APPROACH  | 0.400               | 5800.0        | 13.551                    | 5018.750              | 1.000              | 4.00                    | 0.903              | 334.58               | 2.700                 | 386.67            | 0.00234            |
| TAXI-IDLE | 0.060               | 870.0         | 29.587                    | 783.840               | 1.000              | 7.00                    | 3.452              | 91.45                | 37.746                | 101.50            | 0.03401            |

TOTAL FOR CYCLE: 13.860 1049.05 1384.75  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 13.212  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 10.009  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.195

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 4.596                     | 783.840               | 1.000              | 19.00                   | 1.455              | 248.22               | 5.863                 | 275.50            | 0.00528            |
| TAKEOFF   | 1.000               | 14500.0       | 3.607                     | 8639.344              | 1.000              | 0.70                    | 0.042              | 100.79               | 0.417                 | 169.17            | 0.00025            |
| CLIMBOUT  | 0.850               | 12325.0       | 3.255                     | 7472.914              | 1.000              | 2.20                    | 0.119              | 274.01               | 0.436                 | 451.92            | 0.00026            |
| APPROACH  | 0.400               | 5800.0        | 4.001                     | 5018.750              | 1.000              | 4.00                    | 0.267              | 334.58               | 0.797                 | 386.67            | 0.00069            |
| TAXI-IDLE | 0.060               | 870.0         | 4.596                     | 783.840               | 1.000              | 7.00                    | 0.536              | 91.45                | 5.863                 | 101.50            | 0.00528            |

TOTAL FOR CYCLE: 2.420 1049.05 1384.75  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 2.306  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.747  
 LBS POLLUTANT/1000K LB TH AT T.O.: 2.902

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 1.713                     | 783.840               | 1.000              | 19.00                   | 0.543               | 248.22               | 2.186                 | 275.50            | 0.00197            |
| TAKEOFF   | 1.000               | 14500.0       | 139.669                   | 8639.344              | 1.000              | 0.70                    | 1.629               | 100.79               | 16.167                | 169.17            | 0.00963            |
| CLIMBOUT  | 0.850               | 12325.0       | 89.342                    | 7472.914              | 1.000              | 2.20                    | 3.276               | 274.01               | 11.956                | 451.92            | 0.00725            |
| APPROACH  | 0.400               | 5800.0        | 30.155                    | 5018.750              | 1.000              | 4.00                    | 2.010               | 334.58               | 6.009                 | 386.67            | 0.00520            |
| TAXI-IDLE | 0.060               | 870.0         | 1.713                     | 783.840               | 1.000              | 7.00                    | 0.200               | 91.45                | 2.186                 | 101.50            | 0.00197            |

TOTAL FOR CYCLE: 7.658 1049.05 1384.75  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 7.300  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 5.530  
 LBS POLLUTANT/1000K LB TH AT T.O.: 112.377

DATE: 7/22/71

TEST ORGANIZATION: S W R I T A

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 277 ENGINE TYPE AND MODEL: JTD-9

SERIAL NUMBER: P665165B1

RATED THRUST: 14500.

ENGINE TOTAL TIME: 8082. HRS

TIME SINCE HOT SECTION OVERHAUL: 3142. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8082. HRS  
N2 COMPRESSOR OVERHAUL: 8082. HRS  
COMBUSTION CAN REPLACEMENT: 3142. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3140. HRS  
N1 TURBINE OVERHAUL: 8082. HRS  
N2 TURBINE OVERHAUL: 8082. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.022

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 29.84 FINISH 28.84

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0164

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| FLAPSEN TIME | TEST TIME | POWER THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATIO<br>T.C. | ENGINE SPEED<br>RPM<br>N1 | ENGINE SPEED<br>RPM<br>N2 | MEASURED FUEL<br>FLOW<br>LB/HR | CAS GEN<br>AIR FLOW<br>LB/SEC | CALC F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|--------------|-----------|--------------------------------|--------------------------|---------------------------|---------------------------|--------------------------------|-------------------------------|----------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0          | 1/ 0      | 12400.00                       | 85                       | 7210.00                   | 10950.00                  | 5220.00                        | 118.50                        | 0.012200 | -0.00                                        | 1.64                               | -0.00                                 |
| 4.35         | 2/ 1      | 11340.00                       | 78                       | 7500.00                   | 11200.00                  | 6230.00                        | 131.50                        | 0.013200 | -0.00                                        | 1.91                               | -0.00                                 |
| 7.50         | 3/ 2      | 11580.00                       | 93                       | 8160.00                   | 11570.00                  | 7760.00                        | 144.70                        | 0.015000 | -0.00                                        | 2.02                               | -0.00                                 |
| 11.10        | 4/ 3      | 840.00                         | 5                        | 2960.00                   | 6440.00                   | 840.00                         | 27.10                         | 0.008600 | -0.00                                        | -0.00                              | -0.00                                 |
| 17.40        | 5/ 4      | 12970.00                       | 89                       | 8020.00                   | 11460.00                  | 7340.00                        | 143.50                        | 0.014200 | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 944.00                              | 9.10                               | 14.00               | 2.46                          | 1.00                 | 58.00               | 5.00                     | 63.00                    | -0.00     | -0.00 | -0.00        |
| 78                                | 747.00                              | 11.40                              | 14.00               | 2.65                          | 0.0                  | 73.00               | 5.00                     | 78.00                    | -0.00     | -0.00 | -0.00        |
| 93                                | 1032.00                             | 14.10                              | 11.00               | 2.99                          | 0.0                  | 102.00              | 4.00                     | 106.00                   | -0.00     | -0.00 | -0.00        |
| 5                                 | 696.00                              | 0.40                               | 282.00              | 1.71                          | 96.00                | 2.00                | 8.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 89                                | 1005.00                             | 11.50                              | 11.00               | 2.84                          | 2.00                 | 93.00               | 4.00                     | 97.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|
| 65                                | 1.54                               | 0.05                               | 0.67                                | 3130.70                             | 7.77                               | 8.38                                | 8.03                               | 0.24                               | 3.47                                | 16342.23                            | 40.76                              | 43.75                               |
| 78                                | 1.05                               | 0.0                                | 0.62                                | 3131.59                             | 4.02                               | 9.64                                | 6.46                               | 0.0                                | 3.85                                | 19509.78                            | 56.18                              | 60.03                               |
| 93                                | 0.71                               | 0.0                                | 0.44                                | 3132.05                             | 11.17                              | 11.61                               | 5.69                               | 0.0                                | 3.40                                | 24305.00                            | 86.68                              | 90.08                               |
| 5                                 | 12.17                              | 6.27                               | 1.50                                | 3065.68                             | 0.37                               | 1.87                                | 27.03                              | 5.27                               | 1.26                                | 2575.00                             | 0.31                               | 1.57                                |
| 89                                | 0.77                               | 0.08                               | 0.46                                | 3131.81                             | 10.72                              | 11.19                               | 5.67                               | 0.54                               | 3.38                                | 22987.46                            | 78.69                              | 82.08                               |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 0.242             | 1713.022               | 0.025              | 4.222             | 0.364                  | 4.586                  |
| 78                                | 0.578             | 1720.430               | 0.0                | 4.054             | 0.334                  | 5.294                  |
| 93                                | 0.619             | 1749.764               | 0.0                | 6.383             | 0.250                  | 6.533                  |
| 5                                 | 12.175            | 3065.472               | 0.273              | 0.375             | 1.499                  | 1.874                  |
| 89                                | 0.437             | 1772.357               | 0.045              | 6.017             | 0.261                  | 6.378                  |

CAL ID NUMBER: 277 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P665165B1

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 26.890                    | 738.739               | 1.000              | 19.00                   | 8.515              | 233.93               | 36.399                | 275.50            | 0.03091            |
| TAKEOFF   | 1.000               | 14500.0       | 4.718                     | 8701.129              | 1.000              | 0.70                    | 0.055              | 101.51               | 0.542                 | 169.17            | 0.00033            |
| CLIMBOUT  | 0.850               | 12325.0       | 6.153                     | 7056.152              | 1.000              | 2.20                    | 0.226              | 258.73               | 0.872                 | 451.92            | 0.00050            |
| APPROACH  | 0.400               | 5800.0        | 15.519                    | 3453.174              | 1.000              | 4.00                    | 1.035              | 230.21               | 4.494                 | 386.67            | 0.00268            |
| TAXI-IDLE | 0.060               | 870.0         | 26.890                    | 738.739               | 1.000              | 7.00                    | 3.137              | 86.19                | 36.399                | 101.50            | 0.03091            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 12.967  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 14.241  
LBS POLLUTANT/1000K LB TH AT T.O.: 9.364  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.380

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 4.957                     | 738.739               | 1.000              | 19.00                   | 1.570              | 233.93               | 6.711                 | 275.50            | 0.00570            |
| TAKEOFF   | 1.000               | 14500.0       | 0.148                     | 8701.129              | 1.000              | 0.70                    | 0.002              | 101.51               | 0.017                 | 169.17            | 0.00001            |
| CLIMBOUT  | 0.850               | 12325.0       | 0.363                     | 7056.152              | 1.000              | 2.20                    | 0.013              | 258.73               | 0.051                 | 451.92            | 0.00003            |
| APPROACH  | 0.400               | 5800.0        | 0.913                     | 3453.174              | 1.000              | 4.00                    | 0.061              | 230.21               | 0.264                 | 386.67            | 0.00016            |
| TAXI-IDLE | 0.060               | 870.0         | 4.957                     | 738.739               | 1.000              | 7.00                    | 0.578              | 86.19                | 6.711                 | 101.50            | 0.00570            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.224  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 2.443  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.606  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.119

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 1.303                     | 738.739               | 1.000              | 19.00                   | 0.413               | 233.93               | 1.764                 | 275.50            | 0.00150            |
| TAKEOFF   | 1.000               | 14500.0       | 106.342                   | 8701.129              | 1.000              | 0.70                    | 1.241               | 101.51               | 12.222                | 169.17            | 0.00733            |
| CLIMBOUT  | 0.850               | 12325.0       | 75.212                    | 7056.152              | 1.000              | 2.20                    | 2.758               | 258.73               | 10.659                | 451.92            | 0.00610            |
| APPROACH  | 0.400               | 5800.0        | 17.951                    | 3453.174              | 1.000              | 4.00                    | 1.197               | 230.21               | 5.199                 | 386.67            | 0.00310            |
| TAXI-IDLE | 0.060               | 870.0         | 1.303                     | 738.739               | 1.000              | 7.00                    | 0.152               | 86.19                | 1.764                 | 101.50            | 0.00150            |

TOTAL FOR CYCLE:  
LBS POLLUTANT/1K LB FUEL/CYCLE: 5.760  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.326  
LBS POLLUTANT/1000K LB TH AT T.O.: 4.160  
LBS POLLUTANT/1000K LB TH AT T.O.: 85.563

DATE: 7/22/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMBFP: 278 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P66516582

RATED THRUST: 14500.

ENGINE TOTAL TIME: 8082. HRS

TIME SINCE HOT SECTION OVERHAUL: 3142. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8082. HRS  
N2 COMPRESSOR OVERHAUL: 8082. HRS  
COMBUSTOR CAN REPLACEMENT: 3142. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3140. HRS  
N1 TURBINE OVERHAUL: 8082. HRS  
N2 TURBINE OVERHAUL: 8082. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 76.00

ATMOSPHERIC PRESSURE: START 28.78 FINISH 28.78

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.2174

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | POWER THPUS, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|-------------------------|--------------------|------------------|----------|----|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9480.00                 | 65                 | 7270.00          | 10800.00 |    | 5200.00                  | 111.70                  | 0.012900 | -0.00                               | 1.65                      | -0.00                        |
| 4.40         | 2/ 1      | 11900.00                | 82                 | 7750.00          | 11270.00 |    | 6620.00                  | 124.20                  | 0.014300 | -0.00                               | 1.86                      | -0.00                        |
| 10.15        | 3/ 2      | 13680.00                | 94                 | 8220.00          | 11600.00 |    | 7910.00                  | 141.00                  | 0.015600 | -0.00                               | 2.04                      | -0.00                        |
| 14.25        | 4/ 3      | 850.00                  | 5                  | 2630.00          | 6860.00  |    | 840.00                   | 29.40                   | 0.008200 | -0.00                               | -0.00                     | -0.00                        |
| 16.20        | 5/ 4      | 12560.00                | 86                 | 7870.00          | 11210.00 |    | 7100.00                  | 133.00                  | 0.014800 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | 891.00                     | 9.10                      | 24.00         | 2.56                 | 0.0            | 54.00         | 5.00            | 61.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 968.00                     | 12.10                     | 17.00         | 2.81                 | 0.0            | 76.00         | 6.00            | 82.00           | -0.00     | -0.00 | -0.00        |
| 94                       | 1040.00                    | 14.60                     | 14.00         | 3.27                 | 0.0            | 101.00        | 5.00            | 106.00          | -0.00     | -0.00 | -0.00        |
| 5                        | 673.00                     | 0.50                      | 274.00        | 1.64                 | 99.00          | 3.00          | 4.00            | 11.00           | -0.00     | -0.00 | -0.00        |
| 86                       | 990.00                     | 12.90                     | 15.00         | 2.92                 | 0.0            | 82.00         | 6.00            | 88.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 65                       | 1.87                      | 0.0                       | 0.64                       | 3130.31                    | 7.16                      | 7.80                       | 9.71              | 0.0               | 3.32               | 16277.59           | 37.22             | 40.55              |
| 82                       | 1.21                      | 0.0                       | 0.70                       | 3131.35                    | 8.25                      | 9.55                       | 7.98              | 0.0               | 4.63               | 20729.51           | 54.61             | 63.24              |
| 94                       | 0.91                      | 0.0                       | 0.53                       | 3131.41                    | 10.77                     | 11.30                      | 7.19              | 7.0               | 4.22               | 24772.63           | 85.20             | 84.42              |
| 5                        | 32.58                     | 6.67                      | 1.54                       | 3063.75                    | 0.59                      | 2.15                       | 27.37             | 5.61              | 1.31               | 2571.55            | 0.49              | 1.80               |
| 86                       | 1.09                      | 0.0                       | 0.67                       | 3131.51                    | 9.19                      | 9.87                       | 7.75              | 0.0               | 4.78               | 22231.83           | 65.27             | 70.05              |

| POWER PERCENT RATED T.O. | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 65                       | 1.025          | 1717.045         | 0.0             | 3.927          | 0.351            | 4.277            |
| 82                       | 0.671          | 1751.975         | 0.0             | 4.925          | 0.389            | 5.314            |
| 94                       | 0.526          | 1910.465         | 0.0             | 6.224          | 0.308            | 6.536            |
| 5                        | 31.420         | 2972.497         | 0.519           | 0.572          | 1.526            | 2.098            |
| 86                       | 0.617          | 1770.210         | 0.0             | 5.197          | 0.380            | 5.577            |

CAL ID NUMBER: 278 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P66516582

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 24.526                    | 731.452               | 1.000              | 19.00                   | 7.767              | 231.63               | 33.531                | 275.50            | 0.02819            |
| TAKEOFF                            | 1.000               | 14500.0       | 7.431                     | 8359.258              | 1.000              | 0.70                    | 0.087              | 97.52                | 0.889                 | 169.17            | 0.00051            |
| CLIMBOUT                           | 0.850               | 12325.0       | 7.323                     | 6990.484              | 1.000              | 2.20                    | 0.269              | 256.32               | 1.048                 | 451.92            | 0.00059            |
| APPROACH                           | 0.400               | 5800.0        | 15.486                    | 2916.116              | 1.000              | 4.00                    | 1.032              | 194.41               | 5.310                 | 386.67            | 0.00267            |
| TAXI-IDLE                          | 0.060               | 870.0         | 24.526                    | 731.452               | 1.000              | 7.00                    | 2.861              | 85.34                | 33.531                | 101.50            | 0.02819            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.016             | 865.21               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.888             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.677              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.598              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 5.173                     | 731.452               | 1.000              | 19.00                   | 1.638              | 231.63               | 7.073                 | 275.50            | 0.00595            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.0                       | 8359.258              | 1.000              | 0.70                    | 0.0                | 97.52                | 0.0                   | 169.17            | 0.0                |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.115                     | 6990.484              | 1.000              | 2.20                    | 0.004              | 256.32               | 0.016                 | 451.92            | 0.00001            |
| APPROACH                           | 0.400               | 5800.0        | 0.107                     | 2916.116              | 1.000              | 4.00                    | 0.007              | 194.41               | 0.037                 | 386.67            | 0.00002            |
| TAXI-IDLE                          | 0.060               | 870.0         | 5.173                     | 731.452               | 1.000              | 7.00                    | 0.604              | 85.34                | 7.073                 | 101.50            | 0.00595            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.253              | 865.21               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.604              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.627              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.346                     | 731.452               | 1.000              | 19.00                   | 0.426               | 231.63               | 1.840                 | 275.50            | 0.00155            |
| TAKEOFF                            | 1.000               | 14500.0       | 98.581                    | 8359.258              | 1.000              | 0.70                    | 1.150               | 97.52                | 11.793                | 169.17            | 0.00680            |
| CLIMBOUT                           | 0.850               | 12325.0       | 71.154                    | 6990.484              | 1.000              | 2.20                    | 2.609               | 256.32               | 10.179                | 451.92            | 0.00577            |
| APPROACH                           | 0.400               | 5800.0        | 14.584                    | 2916.116              | 1.000              | 4.00                    | 0.972               | 194.41               | 5.001                 | 386.67            | 0.00251            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.346                     | 731.452               | 1.000              | 7.00                    | 0.157               | 85.34                | 1.840                 | 101.50            | 0.00155            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.314               | 865.21               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.142               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.838               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 79.318              |                      |                       |                   |                    |

DATE: 7/22/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 279 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6654898

RATED THRUST: 14500.

ENGINE TOTAL TIME: 4413. HRS

TIME SINCE HOT SECTION OVERHAUL: 1027. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 4413. HRS  
N2 COMPRESSOR OVERHAUL: 4413. HRS  
COMBUSTOR CAN REPLACEMENT: 1027. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 1027. HRS  
N1 TURBINE OVERHAUL: 4413. HRS  
N2 TURBINE OVERHAUL: 4413. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 71.00 FINISH 71.00

ATMOSPHERIC PRESSURE: START 28.82 FINISH 28.83

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0141

RELATIVE HUMIDITY: 78.00 PERCFNT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED, RPM N1 N2 | MEASURED FUEL FLOW, LB/HR | GAS GEN AIR FLOW, LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP, DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP, DEGREES F |
|--------------|-----------|--------------------|--------------------------|-------------------------|---------------------------|--------------------------|----------|--------------------------------------|---------------------------|-------------------------------|
| 0.0          | 1/ 0      | 9500.00            | 65                       | 7170.00 10840.00        | 5180.00                   | 112.80                   | 0.012800 | -0.00                                | -0.00                     | -0.00                         |
| 13.55        | 2/ 1      | 11900.00           | 82                       | 7700.00 11260.00        | 6570.00                   | 128.00                   | 0.014200 | -0.00                                | -0.00                     | -0.00                         |
| 28.40        | 3/ 2      | 13660.00           | 94                       | 8150.00 11570.00        | 7810.00                   | 142.30                   | 0.015200 | -0.00                                | -0.00                     | -0.00                         |
| 33.40        | 4/ 3      | 1180.00            | 8                        | 3100.00 7530.00         | 1050.00                   | 31.70                    | 0.009200 | -0.00                                | -0.00                     | -0.00                         |
| 39.40        | 5/ 4      | 12660.00           | 87                       | 7870.00 11370.00        | 7100.00                   | 135.10                   | 0.014600 | -0.00                                | -0.00                     | -0.00                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP, DEGREES F | EXHAUST GAS PRESSURE, PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-----------------------------|----------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | 869.00                      | 9.70                       | 28.00         | 2.61                 | 0.0            | 48.00         | 5.00            | 53.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 947.00                      | 12.10                      | 16.00         | 2.87                 | 0.0            | 68.00         | 4.00            | 72.00           | -0.00     | -0.00 | -0.00        |
| 94                       | 974.00                      | 14.50                      | 12.00         | 3.07                 | 0.0            | 88.00         | 5.00            | 93.00           | -0.00     | -0.00 | -0.00        |
| 8                        | 673.00                      | 0.90                       | 417.00        | 1.83                 | 144.00         | 3.00          | 8.00            | 11.00           | -0.00     | -0.00 | -0.00        |
| 87                       | 976.00                      | 13.10                      | 16.00         | 2.97                 | 0.0            | 75.00         | 4.00            | 79.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO, LB/1K LB FUEL | MASS EMI HC, LB/1K LB FUEL | MASS EMI NO2, LB/1K LB FUEL | MASS EMI CO2, LB/1K LB FUEL | MASS EMI NO, LB/1K LB FUEL | MASS EMI NOX, LB/1K LB FUEL | MASS EMI CO, LB/HR | MASS EMI HC, LB/HR | MASS EMI NO2, LB/HR | MASS EMI CO2, LB/HR | MASS EMI NO, LB/HR | MASS EMI NOX, LB/HR |
|--------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| 65                       | 2.14                       | 0.0                        | 0.63                        | 3129.88                     | 6.02                       | 6.64                        | 11.07              | 0.0                | 3.25                | 16212.79            | 31.17              | 34.42               |
| 82                       | 1.11                       | 0.0                        | 0.46                        | 3131.47                     | 7.76                       | 8.21                        | 7.30               | 0.0                | 3.00                | 20573.92            | 50.96              | 53.96               |
| 94                       | 0.74                       | 0.0                        | 0.53                        | 3132.02                     | 9.39                       | 9.92                        | 6.09               | 0.0                | 4.16                | 24461.05            | 73.30              | 77.46               |
| 8                        | 44.09                      | 8.72                       | 1.39                        | 3040.05                     | 0.52                       | 1.91                        | 46.29              | 9.16               | 1.46                | 3192.05             | 0.55               | 2.01                |
| 87                       | 1.07                       | 0.0                        | 0.44                        | 3131.55                     | 8.27                       | 8.71                        | 7.62               | 0.0                | 3.13                | 22234.03            | 59.70              | 61.83               |

| POWER PERCENT RATED T.O. | CO, LB/1K#TH-HR | CO 2, LB/1K#TH-HR | THC, LB/1K#TH-HR | NO, LB/1K#TH-HR | NO 2, LB/1K#TH-HR | NO X, LB/1K#TH-HR |
|--------------------------|-----------------|-------------------|------------------|-----------------|-------------------|-------------------|
| 65                       | 1.165           | 1706.609          | 0.0              | 3.281           | 0.347             | 3.623             |
| 82                       | 0.613           | 1728.901          | 0.0              | 4.282           | 0.252             | 4.534             |
| 94                       | 0.445           | 1790.706          | 0.0              | 5.366           | 0.305             | 5.671             |
| 8                        | 39.231          | 2705.126          | 7.759            | 0.464           | 1.236             | 1.700             |
| 87                       | 0.602           | 1756.243          | 0.0              | 4.636           | 0.247             | 4.884             |

CAL ID NUMBER: 279 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6654898

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 45.201                    | 748.448               | 1.000              | 19.00                   | 14.314             | 237.01               | 60.393                | 275.50            | 0.05195            |
| TAKEOFF                            | 1.000               | 14500.0       | 6.531                     | 8296.590              | 1.000              | 0.70                    | 0.076              | 96.79                | 0.787                 | 169.17            | 0.00045            |
| CLIMBOUT                           | 0.850               | 12325.0       | 7.897                     | 6848.914              | 1.000              | 2.20                    | 0.290              | 251.13               | 1.153                 | 451.92            | 0.00064            |
| APPROACH                           | 0.400               | 5800.0        | 20.753                    | 3470.408              | 1.000              | 4.00                    | 1.384              | 231.36               | 5.980                 | 386.67            | 0.00358            |
| TAXI-IDLE                          | 0.060               | 870.0         | 45.201                    | 748.448               | 1.000              | 7.00                    | 5.273              | 87.32                | 60.393                | 101.50            | 0.05195            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 21.336             | 903.61               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 23.612             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 15.408             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.525              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 10.131                    | 748.448               | 1.000              | 19.00                   | 3.208              | 237.01               | 13.536                | 275.50            | 0.01164            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.332                     | 8296.590              | 1.000              | 0.70                    | 0.004              | 96.79                | 0.040                 | 169.17            | 0.00002            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.274                     | 6848.914              | 1.000              | 2.20                    | 0.010              | 251.13               | 0.040                 | 451.92            | 0.00002            |
| APPROACH                           | 0.400               | 5800.0        | 0.270                     | 3470.408              | 1.000              | 4.00                    | 0.018              | 231.36               | 0.078                 | 386.67            | 0.00005            |
| TAXI-IDLE                          | 0.060               | 870.0         | 10.131                    | 748.448               | 1.000              | 7.00                    | 1.182              | 87.32                | 13.536                | 101.50            | 0.01164            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.422              | 903.61               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.894              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.193              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.267              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.004                     | 748.448               | 1.000              | 19.00                   | 0.318               | 237.01               | 1.341                 | 275.50            | 0.00115            |
| TAKEOFF                            | 1.000               | 14500.0       | 86.323                    | 8296.590              | 1.000              | 0.70                    | 1.007               | 96.79                | 10.405                | 169.17            | 0.00595            |
| CLIMBOUT                           | 0.850               | 12325.0       | 60.330                    | 6848.914              | 1.000              | 2.20                    | 2.212               | 251.13               | 8.809                 | 451.92            | 0.00489            |
| APPROACH                           | 0.400               | 5800.0        | 13.859                    | 3470.408              | 1.000              | 4.00                    | 0.924               | 231.36               | 3.993                 | 386.67            | 0.00239            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.004                     | 748.448               | 1.000              | 7.00                    | 0.117               | 87.32                | 1.341                 | 101.50            | 0.00115            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.578               | 903.61               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.066               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.306               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 69.456              |                      |                       |                   |                    |

DATE: 7/23/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMBER: 280 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P6651708

RATED THRUST: 14500.

ENGINE TOTAL TIME: 8088. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 8088. HRS

N2 COMPRESSOR OVERHAUL: 8088. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 8088. HRS

N2 TURBINE OVERHAUL: 8088. HRS

FUEL: JP-4 TF

FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 28.81 FINISH 28.81

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0161

RELATIVE HUMIDITY: 57.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

F/A AND AIRFLOW CALCULATED FROM EXHAUST COMPOSITION FOR FOURTH RUN. NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9540.00                           | 65                       | 7230.00                | 5490.00                           | 111.10                        | 0.013700    | -0.00                                        | 1.65                               | -0.00                                 |
| 11.40           | 2/ 1         | 11740.00                          | 80                       | 7720.00                | 6820.00                           | 126.10                        | 0.015000    | -0.00                                        | 1.84                               | -0.00                                 |
| 16.25           | 3/ 2         | 13760.00                          | 94                       | 8230.00                | 8300.00                           | 140.40                        | 0.016400    | -0.00                                        | 2.03                               | -0.00                                 |
| 22.50           | 4/ 3         | 670.00                            | 4                        | 2440.00                | 6490.00                           | 910.00                        | 0.008500    | -0.00                                        | -0.00                              | -0.00                                 |
| 27.00           | 5/ 4         | 13550.00                          | 93                       | 8220.00                | 8250.00                           | 138.90                        | 0.016500    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 864.00                              | 9.10                               | 16.00               | 2.76                          | 1.00                 | 62.00               | 3.00                     | 65.00                    | -0.00     | -0.00 | -0.00        |
| 80                                | 943.00                              | 11.90                              | 14.00               | 3.02                          | 0.0                  | 80.00               | 5.00                     | 85.00                    | -0.00     | -0.00 | -0.00        |
| 94                                | 1019.00                             | 14.50                              | 10.00               | 3.21                          | 0.0                  | 111.00              | 5.00                     | 116.00                   | -0.00     | -0.00 | -0.00        |
| 4                                 | 705.00                              | 0.40                               | 324.00              | 1.69                          | 144.00               | 3.00                | 9.00                     | 12.00                    | -0.00     | -0.00 | -0.00        |
| 93                                | 1095.00                             | 14.40                              | 9.00                | 3.25                          | 0.0                  | 108.00              | 3.00                     | 111.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 65                                | 1.16                               | 0.04                               | 0.36                                | 3131.31                             | 7.35                               | 7.71                                | 6.34                    | 0.23                    | 1.95                     | 17190.91                 | 40.37                   | 42.32                    |
| 80                                | 0.92                               | 0.0                                | 0.54                                | 3131.79                             | 8.67                               | 9.21                                | 6.30                    | 0.0                     | 3.70                     | 21358.80                 | 59.15                   | 62.85                    |
| 94                                | 0.62                               | 0.0                                | 0.51                                | 3132.26                             | 11.32                              | 11.83                               | 5.15                    | 0.0                     | 4.23                     | 25957.79                 | 93.98                   | 98.21                    |
| 4                                 | 37.20                              | 9.47                               | 1.70                                | 3048.81                             | 0.57                               | 2.26                                | 33.85                   | 8.62                    | 1.54                     | 2774.42                  | 0.51                    | 2.06                     |
| 93                                | 0.55                               | 0.0                                | 0.30                                | 3132.37                             | 10.88                              | 11.18                               | 4.55                    | 0.0                     | 2.49                     | 25842.08                 | 89.77                   | 92.27                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 0.665             | 1931.982               | 0.024              | 4.232             | 0.205                  | 4.436                  |
| 80                                | 0.537             | 1814.318               | 0.0                | 5.038             | 0.315                  | 5.353                  |
| 94                                | 0.375             | 1889.375               | 0.0                | 6.830             | 0.308                  | 7.138                  |
| 4                                 | 50.526            | 4140.922               | 12.861             | 0.769             | 2.305                  | 3.074                  |
| 93                                | 0.336             | 1907.165               | 0.0                | 6.625             | 0.184                  | 6.809                  |

CAL ID NUMBER: 280 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S M R I TWA

SERIAL NUMBER: P6651708

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 28.619                    | 899.137               | 1.000              | 19.00                   | 9.063              | 284.73               | 31.829                | 275.50            | 0.03289            |
| TAKEOFF                            | 1.000               | 14500.0       | 5.517                     | 8912.793              | 1.000              | 0.70                    | 0.064              | 103.98               | 0.619                 | 169.17            | 0.00038            |
| CLIMBOUT                           | 0.850               | 12325.0       | 5.858                     | 7136.168              | 1.000              | 2.20                    | 0.215              | 261.66               | 0.821                 | 451.92            | 0.00048            |
| APPROACH                           | 0.400               | 5800.0        | 11.291                    | 3933.170              | 1.000              | 4.00                    | 0.753              | 262.21               | 2.871                 | 386.67            | 0.00195            |
| TAXI-IDLE                          | 0.060               | 870.0         | 28.619                    | 899.137               | 1.000              | 7.00                    | 3.339              | 104.90               | 31.829                | 101.50            | 0.03289            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 13.433             | 1017.48              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.202             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.701              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.444              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 6.070                     | 899.137               | 1.000              | 19.00                   | 1.922              | 284.73               | 6.751                 | 275.50            | 0.00698            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.881                     | 8912.793              | 1.000              | 0.70                    | 0.010              | 103.98               | 0.099                 | 169.17            | 0.00006            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.289                     | 7136.168              | 1.000              | 2.20                    | 0.011              | 261.66               | 0.041                 | 451.92            | 0.00002            |
| APPROACH                           | 0.400               | 5800.0        | 1.041                     | 3933.170              | 1.000              | 4.00                    | 0.069              | 262.21               | 0.265                 | 386.67            | 0.00018            |
| TAXI-IDLE                          | 0.060               | 870.0         | 6.070                     | 899.137               | 1.000              | 7.00                    | 0.708              | 104.90               | 6.751                 | 101.50            | 0.00698            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.721              | 1017.48              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.674              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.965              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.708              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.137                     | 899.137               | 1.000              | 19.00                   | 0.677               | 284.73               | 2.377                 | 275.50            | 0.00246            |
| TAKEOFF                            | 1.000               | 14500.0       | 114.861                   | 8912.793              | 1.000              | 0.70                    | 1.340               | 103.98               | 12.887                | 169.17            | 0.00792            |
| CLIMBOUT                           | 0.850               | 12325.0       | 71.512                    | 7136.168              | 1.000              | 2.20                    | 2.622               | 261.66               | 10.021                | 451.92            | 0.00580            |
| APPROACH                           | 0.400               | 5800.0        | 21.008                    | 3933.170              | 1.000              | 4.00                    | 1.401               | 262.21               | 5.341                 | 386.67            | 0.00362            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.137                     | 899.137               | 1.000              | 7.00                    | 0.249               | 104.90               | 2.377                 | 101.50            | 0.00246            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.289               | 1017.48              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.181               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.542               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 92.416              |                      |                       |                   |                    |

DATE: 7/27/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA .....

CAL ID NUMBER: 283 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6489158

RATE THRUST: 14500.

ENGINE TOTAL TIME: 15252. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 15252. HRS  
N2 COMPRESSOR OVERHAUL: 15252. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 15252. HRS  
N2 TURBINE OVERHAUL: 15252. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 28.83 FINISH 28.83

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0107

RELATIVE HUMIDITY: 62.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

N02 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9680.00                  | 66                 | 7280.00          | 10960.00                 | 5600.00                 | 0.013200 | -0.00                               | 1.65                      | -0.00                        |
| 7.20         | 2/ 1      | 11370.00                 | 73                 | 7690.00          | 11270.00                 | 6630.00                 | 0.014200 | -0.00                               | 1.79                      | -0.00                        |
| 12.30        | 3/ 2      | 12850.00                 | 88                 | 8050.00          | 11510.00                 | 7630.00                 | 0.015100 | -0.00                               | 1.92                      | -0.00                        |
| 14.30        | 4/ 3      | 1040.00                  | 7                  | 2930.00          | 7150.00                  | 1010.00                 | 0.008200 | -0.00                               | -0.00                     | -0.00                        |
| 21.00        | 5/ 4      | 17770.00                 | 88                 | 8020.00          | 11420.00                 | 7600.00                 | 0.015100 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYDES | SNOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 66                       | 887.00                     | 9.20                      | 15.00         | 2.59                 | 1.00           | 63.00         | 2.00            | 65.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 937.00                     | 11.20                     | 11.00         | 2.78                 | 0.0            | 85.00         | 2.00            | 87.00           | -0.00     | -0.00 | -0.00        |
| 88                       | 986.00                     | 13.00                     | 10.00         | 2.93                 | 0.0            | 101.00        | 2.00            | 103.00          | -0.00     | -0.00 | -0.00        |
| 7                        | 678.00                     | 0.70                      | 211.00        | 1.65                 | 42.00          | 12.00         | 3.00            | 15.00           | -0.00     | -0.00 | -0.00        |
| 88                       | 984.00                     | 12.90                     | 10.00         | 2.95                 | 0.0            | 99.00         | 3.00            | 102.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 66                       | 1.15                      | 0.04                      | 0.25                       | 3131.31                    | 7.96                      | 8.22                       | 6.46              | 0.25              | 1.42               | 17535.32           | 44.59             | 46.01              |
| 78                       | 0.79                      | 0.0                       | 0.24                       | 3132.00                    | 10.01                     | 10.25                      | 5.23              | 0.0               | 1.56               | 20765.17           | 66.37             | 67.93              |
| 88                       | 0.68                      | 0.0                       | 0.22                       | 3132.17                    | 11.29                     | 11.51                      | 5.19              | 0.0               | 1.71               | 23898.46           | 86.12             | 87.83              |
| 7                        | 25.12                     | 2.86                      | 0.59                       | 3085.93                    | 2.35                      | 2.93                       | 25.37             | 2.89              | 0.59               | 3116.78            | 2.37              | 2.96               |
| 88                       | 0.68                      | 0.0                       | 0.33                       | 3132.18                    | 10.99                     | 11.32                      | 5.14              | 0.0               | 2.53               | 23804.55           | 83.51             | 86.04              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 66                       | 0.668          | 1811.500         | 0.025           | 4.606          | 0.146            | 4.753            |
| 78                       | 0.460          | 1826.312         | 0.0             | 5.838          | 0.137            | 5.975            |
| 88                       | 0.404          | 1859.802         | 0.0             | 6.702          | 0.133            | 6.835            |
| 7                        | 24.391         | 2996.909         | 2.781           | 2.279          | 0.570            | 2.848            |
| 88                       | 0.402          | 1864.100         | 0.0             | 6.540          | 0.198            | 6.738            |

CAL ID NUMBER: 283 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: 15252.

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 25.947                    | 803.260               | 1.000              | 19.00                   | 8.217              | 254.37               | 32.303                | 275.50            | 0.02982            |
| TAKEOFF                            | 1.000               | 14500.0       | 4.943                     | 8405.980              | 1.000              | 0.70                    | 0.058              | 98.07                | 0.588                 | 169.17            | 0.00034            |
| CLIMBOUT                           | 0.850               | 12325.0       | 4.665                     | 7264.555              | 1.000              | 2.20                    | 0.171              | 266.37               | 0.642                 | 451.92            | 0.00038            |
| APPROACH                           | 0.400               | 5800.0        | 11.143                    | 3231.328              | 1.000              | 4.00                    | 0.743              | 215.42               | 3.448                 | 386.67            | 0.00192            |
| TAXI-IDLE                          | 0.060               | 870.0         | 25.947                    | 803.260               | 1.000              | 7.00                    | 3.027              | 93.71                | 32.303                | 101.50            | 0.02982            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.215             | 927.94               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.164             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.821              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.398              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.648                     | 803.260               | 1.000              | 19.00                   | 0.839              | 254.37               | 3.296                 | 275.50            | 0.00304            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.170                     | 8405.980              | 1.000              | 0.70                    | 0.002              | 98.07                | 0.020                 | 169.17            | 0.00001            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.073                     | 7264.555              | 1.000              | 2.20                    | 0.003              | 266.37               | 0.010                 | 451.92            | 0.00001            |
| APPROACH                           | 0.400               | 5800.0        | 1.208                     | 3231.328              | 1.000              | 4.00                    | 0.081              | 215.42               | 0.374                 | 386.67            | 0.00021            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.648                     | 803.260               | 1.000              | 7.00                    | 0.309              | 93.71                | 3.296                 | 101.50            | 0.00304            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 1.233              | 927.94               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 1.328              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 0.890              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.137              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.847                     | 803.260               | 1.000              | 19.00                   | 0.585               | 254.37               | 2.300                 | 275.50            | 0.00212            |
| TAKEOFF                            | 1.000               | 14500.0       | 109.397                   | 8405.980              | 1.000              | 0.70                    | 1.276               | 98.07                | 13.014                | 169.17            | 0.00754            |
| CLIMBOUT                           | 0.850               | 12325.0       | 80.286                    | 7264.555              | 1.000              | 2.20                    | 2.944               | 266.37               | 11.052                | 451.92            | 0.00651            |
| APPROACH                           | 0.400               | 5800.0        | 16.341                    | 3231.328              | 1.000              | 4.00                    | 1.089               | 215.42               | 5.057                 | 386.67            | 0.00282            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.847                     | 803.260               | 1.000              | 7.00                    | 0.215               | 93.71                | 2.300                 | 101.50            | 0.00212            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.110               | 927.94               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.584               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.412               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 88.020              |                      |                       |                   |                    |

DATE: 11/20/11

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 284 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P6742508

RATED THRUST: 14500.

ENGINE TOTAL TIME: 3673. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 3673. HRS  
 N2 COMPRESSOR OVERHAUL: 3673. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 3673. HRS  
 N2 TURBINE OVERHAUL: 3673. HRS

FUEL: JP-4 TF

FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 66.00 FINISH 67.00

ATMOSPHERIC PRESSURE: START 28.90 FINISH 28.91

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 84.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9520.00                           | 65                       | 7120.00                | 10890.00                          | 5270.00                       | 117.00      | 0.012500                                     | -0.00                              | -0.00                                 |
| 18.00           | 2/ 1         | 11020.00                          | 75                       | 7520.00                | 11150.00                          | 6150.00                       | 128.00      | 0.013300                                     | -0.00                              | -0.00                                 |
| 33.00           | 3/ 2         | 13700.00                          | 94                       | 8150.00                | 11580.00                          | 8040.00                       | 148.00      | 0.015100                                     | -0.00                              | -0.00                                 |
| 40.00           | 4/ 3         | 860.00                            | 5                        | 2600.00                | 6840.00                           | 850.00                        | 31.20       | 0.007600                                     | -0.00                              | -0.00                                 |
| 45.00           | 5/ 4         | 12740.00                          | 87                       | 7870.00                | 11400.00                          | 7320.00                       | 141.00      | 0.014400                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 833.00                              | 9.10                               | 13.00               | 2.48                          | 0.0                  | 58.00               | 5.00                     | 63.00                    | -0.00     | -0.00 | -0.00        |
| 75                                | 880.00                              | 10.90                              | 11.00               | 2.67                          | 0.0                  | 80.00               | 6.00                     | 86.00                    | -0.00     | -0.00 | -0.00        |
| 94                                | 970.00                              | 14.40                              | 8.00                | 2.92                          | 0.0                  | 120.00              | 6.00                     | 126.00                   | -0.00     | -0.00 | -0.00        |
| 5                                 | 662.00                              | 0.60                               | 331.00              | 1.57                          | 140.00               | 3.00                | 7.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 87                                | 945.00                              | 13.00                              | 10.00               | 2.83                          | 1.00                 | 101.00              | 4.00                     | 105.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/LK<br>LB FUEL | MASS EMI<br>HC<br>LB/LK<br>LB FUEL | MASS EMI<br>NO2<br>LB/LK<br>LB FUEL | MASS EMI<br>CO2<br>LB/LK<br>LB FUEL | MASS EMI<br>NO<br>LB/LK<br>LB FUEL | MASS EMI<br>NOX<br>LB/LK<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 65                                | 1.04                               | 0.0                                | 0.66                                | 7131.60                             | 7.66                               | 8.32                                | 5.51                    | 0.0                     | 3.48                     | 16503.53                 | 40.35                   | 43.83                    |
| 75                                | 0.82                               | 0.0                                | 0.74                                | 3131.95                             | 9.81                               | 10.55                               | 5.05                    | 0.0                     | 4.52                     | 19261.50                 | 60.33                   | 64.86                    |
| 94                                | 0.55                               | 0.0                                | 0.67                                | 3132.38                             | 13.46                              | 14.13                               | 4.39                    | 0.0                     | 5.41                     | 25184.36                 | 108.20                  | 113.61                   |
| 5                                 | 40.82                              | 9.89                               | 1.42                                | 3041.98                             | 0.61                               | 2.03                                | 34.69                   | 8.40                    | 1.21                     | 2585.68                  | 0.57                    | 1.72                     |
| 87                                | 0.70                               | 0.04                               | 0.46                                | 3132.02                             | 11.69                              | 12.15                               | 5.16                    | 0.30                    | 3.39                     | 22926.41                 | 85.54                   | 88.92                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/LK#TH-HR | CO<br>2<br>LB/LK#TH-HR | THC<br>LB/LK#TH-HR | NO<br>LB/LK#TH-HR | NO<br>2<br>LB/LK#TH-HR | NO<br>X<br>LB/LK#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 0.578             | 1733.564               | 0.0                | 4.238             | 0.365                  | 4.604                  |
| 75                                | 0.458             | 1747.867               | 0.0                | 5.475             | 0.411                  | 5.885                  |
| 94                                | 0.321             | 1838.275               | 0.0                | 7.898             | 0.395                  | 8.292                  |
| 5                                 | 40.343            | 3006.609               | 9.773              | 0.601             | 1.401                  | 2.002                  |
| 87                                | 0.405             | 1799.562               | 0.023              | 6.714             | 0.266                  | 6.980                  |

CAL ID NUMBER: 284 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6742508

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 40.008                    | 886.145               | 1.000              | 19.00                   | 12.669             | 280.61               | 45.148                | 275.50            | 0.04599            |
| TAKEOFF                            | 1.000               | 14500.0       | 6.207                     | 8828.016              | 1.000              | 0.70                    | 0.072              | 102.99               | 0.703                 | 169.17            | 0.00043            |
| CLIMBOUT                           | 0.850               | 12325.0       | 4.366                     | 7070.793              | 1.000              | 2.20                    | 0.160              | 259.26               | 0.618                 | 451.92            | 0.00035            |
| APPROACH                           | 0.400               | 5800.0        | 14.659                    | 3551.601              | 1.000              | 4.00                    | 0.977              | 236.77               | 4.128                 | 386.67            | 0.00253            |
| TAXI-IDLE                          | 0.060               | 870.0         | 40.008                    | 886.145               | 1.000              | 7.00                    | 4.668              | 103.38               | 45.148                | 101.50            | 0.04599            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 18.547             | 983.02               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.867             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.393             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.499              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 9.451                     | 886.145               | 1.000              | 19.00                   | 2.993              | 280.61               | 10.665                | 275.50            | 0.01086            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.168                     | 8828.016              | 1.000              | 0.70                    | 0.002              | 102.99               | 0.019                 | 169.17            | 0.00001            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.267                     | 7070.793              | 1.000              | 2.20                    | 0.010              | 259.26               | 0.038                 | 451.92            | 0.00002            |
| APPROACH                           | 0.400               | 5800.0        | 0.429                     | 3551.601              | 1.000              | 4.00                    | 0.029              | 236.77               | 0.121                 | 386.67            | 0.00007            |
| TAXI-IDLE                          | 0.060               | 870.0         | 9.451                     | 886.145               | 1.000              | 7.00                    | 1.103              | 103.38               | 10.665                | 101.50            | 0.01086            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.136              | 983.02               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.207              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.987              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.135              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.610                     | 886.145               | 1.000              | 19.00                   | 0.510               | 280.61               | 1.817                 | 275.50            | 0.00185            |
| TAKEOFF                            | 1.000               | 14500.0       | 133.453                   | 8828.016              | 1.000              | 0.70                    | 1.557               | 102.99               | 15.117                | 169.17            | 0.00920            |
| CLIMBOUT                           | 0.850               | 12325.0       | 85.160                    | 7070.793              | 1.000              | 2.20                    | 3.123               | 259.26               | 12.044                | 451.92            | 0.00691            |
| APPROACH                           | 0.400               | 5800.0        | 15.307                    | 3551.601              | 1.000              | 4.00                    | 1.020               | 236.77               | 4.310                 | 386.67            | 0.00264            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.610                     | 886.145               | 1.000              | 7.00                    | 0.188               | 103.38               | 1.817                 | 101.50            | 0.00185            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.398               | 983.02               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.508               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.620               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 107.376             |                      |                       |                   |                    |

DATE: 7/28/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 286 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6742508

RATED THRUST: 14500.

ENGINE TOTAL TIME: 3673. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 3673. HRS  
 N2 COMPRESSOR OVERHAUL: 3673. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 3673. HRS  
 N2 TURBINE OVERHAUL: 3673. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 67.00 FINISH 68.00

ATMOSPHERIC PRESSURE: START 28.98 FINISH 28.98

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0076

RELATIVE HUMIDITY: 54.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.  
 COMMENT LISTED ON CAL ID #285 ALSO APPLY.

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |       |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|-------|
| 0.0             | 1/ 0         | 10820.00                          | 74                       | 7360.00                | 11080.00                          | 6010.00                       | 126.30      | 0.013200                                     | -0.00                              | 1.76                                  | -0.00 |
| 5.00            | 2/ 1         | 11990.00                          | 82                       | 7620.00                | 11280.00                          | 6730.00                       | 135.00      | 0.013800                                     | -0.00                              | 1.87                                  | -0.00 |
| 10.00           | 3/ 2         | 13850.00                          | 95                       | 8100.00                | 11600.00                          | 8050.00                       | 149.00      | 0.015000                                     | -0.00                              | 2.04                                  | -0.00 |
| 15.00           | 4/ 3         | 870.00                            | 5                        | 2650.00                | 6800.00                           | 870.00                        | 37.20       | 0.007500                                     | -0.00                              | -0.00                                 | -0.00 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 74                                | 883.00                              | 10.70                              | 12.00               | 2.69                          | 1.00                 | 74.00               | 5.00                     | 79.00                    | -0.00     | -0.00 | -0.00        |
| 82                                | 918.00                              | 12.30                              | 10.00               | 2.83                          | 1.00                 | 93.00               | 5.00                     | 98.00                    | -0.00     | -0.00 | -0.00        |
| 95                                | 981.00                              | 14.70                              | 9.00                | 3.07                          | 0.0                  | 135.00              | 6.00                     | 141.00                   | -0.00     | -0.00 | -0.00        |
| 5                                 | 653.00                              | 0.60                               | 272.00              | 1.56                          | 138.00               | 5.00                | 6.00                     | 11.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/PP | MASS EMI<br>NOX<br>LB/PP |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 74                                | 0.89                               | 0.04                               | 0.61                                | 3131.73                             | 9.01                               | 9.61                                | 5.34                    | 0.26                    | 3.66                     | 18821.68                 | 54.13                   | 57.79                    |
| 82                                | 0.70                               | 0.04                               | 0.58                                | 3132.02                             | 10.76                              | 11.34                               | 4.74                    | 0.27                    | 3.89                     | 21078.52                 | 72.41                   | 76.31                    |
| 95                                | 0.58                               | 0.0                                | 0.64                                | 3132.32                             | 14.40                              | 15.04                               | 4.70                    | 0.0                     | 5.15                     | 25215.20                 | 115.92                  | 121.07                   |
| 5                                 | 33.88                              | 9.84                               | 1.23                                | 3053.00                             | 1.02                               | 2.25                                | 25.47                   | 8.56                    | 1.07                     | 2656.11                  | 0.89                    | 1.96                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 74                                | 0.494             | 1739.527               | 0.024              | 5.003             | 0.138                  | 5.341                  |
| 82                                | 0.395             | 1758.008               | 0.023              | 6.039             | 0.125                  | 6.364                  |
| 95                                | 0.340             | 1820.592               | 0.0                | 8.369             | 0.172                  | 8.741                  |
| 5                                 | 33.879            | 3053.004               | 9.844              | 1.023             | 1.228                  | 2.250                  |

CAL ID NUMBER: 286 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6742508

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 33.198                    | 829.335               | 1.000              | 19.00                   | 10.513             | 262.62               | 40.030                | 275.50            | 0.03816            |
| TAKEOFF                            | 1.000               | 14500.0       | 3.499                     | 8596.344              | 1.000              | 0.70                    | 0.041              | 100.29               | 0.407                 | 169.17            | 0.00024            |
| CLIMBOUT                           | 0.850               | 12325.0       | 4.600                     | 7090.523              | 1.000              | 2.20                    | 0.169              | 259.99               | 0.649                 | 451.92            | 0.00037            |
| APPROACH                           | 0.400               | 5800.0        | 16.010                    | 3627.520              | 1.000              | 4.00                    | 1.067              | 241.83               | 4.413                 | 386.67            | 0.00276            |
| TAXI-IDLE                          | 0.060               | 870.0         | 33.198                    | 829.335               | 1.000              | 7.00                    | 3.873              | 96.76                | 40.030                | 101.50            | 0.03816            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.663             | 961.49               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.290             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.311             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.282              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 9.701                     | 829.335               | 1.000              | 19.00                   | 3.072              | 262.62               | 11.697                | 275.50            | 0.01115            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.665                     | 8596.344              | 1.000              | 0.70                    | 0.008              | 100.29               | 0.077                 | 169.17            | 0.00005            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.723                     | 7090.523              | 1.000              | 2.20                    | 0.027              | 259.99               | 0.102                 | 451.92            | 0.00006            |
| APPROACH                           | 0.400               | 5800.0        | 1.184                     | 3627.520              | 1.000              | 4.00                    | 0.079              | 241.83               | 0.326                 | 386.67            | 0.00020            |
| TAXI-IDLE                          | 0.060               | 870.0         | 9.701                     | 829.335               | 1.000              | 7.00                    | 1.132              | 96.76                | 11.697                | 101.50            | 0.01115            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.317              | 961.49               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.490              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.117              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.535              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.924                     | 829.335               | 1.000              | 19.00                   | 0.609               | 262.62               | 2.320                 | 275.50            | 0.00221            |
| TAKEOFF                            | 1.000               | 14500.0       | 139.373                   | 8596.344              | 1.000              | 0.70                    | 1.626               | 100.29               | 16.213                | 169.17            | 0.00961            |
| CLIMBOUT                           | 0.850               | 12325.0       | 87.191                    | 7090.523              | 1.000              | 2.20                    | 3.197               | 259.99               | 12.297                | 451.92            | 0.00707            |
| APPROACH                           | 0.400               | 5800.0        | 13.813                    | 3627.520              | 1.000              | 4.00                    | 0.921               | 241.83               | 3.808                 | 386.67            | 0.00238            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.924                     | 829.335               | 1.000              | 7.00                    | 0.224               | 96.76                | 2.320                 | 101.50            | 0.00221            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.578               | 961.49               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.841               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.750               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 112.139             |                      |                       |                   |                    |

DATE: 7/29/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 287 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6545898

RATED THRUST: 14500.

ENGINE TOTAL TIME: 4226. HRS

TIME SINCE HOT SECTION OVERHAUL: 242. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 4226. HRS  
N2 COMPRESSOR OVERHAUL: 4226. HRS  
COMBUSTOR CAN REPLACEMENT: 242. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 242. HRS  
N1 TURBINE OVERHAUL: 4226. HRS  
N2 TURBINE OVERHAUL: 4226. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 58.00 FINISH 58.00

ATMOSPHERIC PRESSURE: START 29.01 FINISH 29.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0110

RELATIVE HUMIDITY: 97.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

ENGINE EQUIPPED WITH SMOKFLESS BURNER CANS. NC2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TFST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9500.00            | 65                       | 7220.00            | 10700.00         | 5400.00                  | 118.00                  | 0.012700 | -0.00                               | 1.64                      | -0.00                        |
| 15.00        | 2/ 1      | 11400.00           | 78                       | 7550.00            | 11170.00         | 6500.00                  | 132.20                  | 0.013700 | -0.00                               | -0.00                     | -0.00                        |
| 28.00        | 3/ 2      | 13200.00           | 91                       | 8000.00            | 11480.00         | 7810.00                  | 145.70                  | 0.014900 | -0.00                               | -0.00                     | -0.00                        |
| 31.00        | 4/ 3      | 10200.00           | 7                        | 2850.00            | 7110.00          | 980.00                   | 34.50                   | 0.007900 | -0.00                               | -0.00                     | -0.00                        |
| 37.00        | 5/ 4      | 13260.00           | 91                       | 7960.00            | 11450.00         | 7840.00                  | 146.20                  | 0.014900 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | 846.00                     | 9.10                      | 16.00         | 2.58                 | 0.0            | 69.00         | 6.00            | 75.00           | -0.00     | -0.00 | -0.00        |
| 78                       | 907.00                     | 11.50                     | 11.00         | 2.80                 | 0.0            | 89.00         | 5.00            | 94.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 977.00                     | 13.60                     | 9.00          | 3.00                 | 0.0            | 121.00        | 5.00            | 126.00          | -0.00     | -0.00 | -0.00        |
| 7                        | 658.00                     | 0.60                      | 354.00        | 1.64                 | 142.00         | 3.00          | 9.00            | 12.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 977.00                     | 13.50                     | 8.00          | 2.99                 | 0.0            | 116.00        | 4.00            | 120.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HP | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 65                       | 1.24                      | 0.0                       | 0.76                       | 3131.30                    | 8.75                      | 9.52                       | 6.67              | 0.0               | 4.11               | 16909.02           | 47.27             | 51.39              |
| 78                       | 0.78                      | 0.0                       | 0.58                       | 3132.01                    | 10.41                     | 10.99                      | 5.09              | 0.0               | 3.80               | 20358.06           | 67.65             | 71.45              |
| 91                       | 0.60                      | 0.0                       | 0.55                       | 3132.30                    | 13.21                     | 13.75                      | 4.67              | 0.0               | 4.26               | 24463.27           | 103.15            | 107.41             |
| 7                        | 41.78                     | 9.60                      | 1.74                       | 3041.26                    | 0.58                      | 2.33                       | 40.95             | 9.41              | 1.71               | 2980.44            | 0.57              | 2.28               |
| 91                       | 0.53                      | 0.0                       | 0.44                       | 3132.40                    | 12.70                     | 13.14                      | 4.18              | 0.0               | 3.43               | 24558.04           | 99.60             | 103.04             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 65                       | 0.703          | 1779.896         | 0.0             | 4.976          | 0.433            | 5.409            |
| 78                       | 0.447          | 1785.795         | 0.0             | 5.934          | 0.333            | 6.267            |
| 91                       | 0.354          | 1853.278         | 0.0             | 7.814          | 0.323            | 8.137            |
| 7                        | 40.142         | 2921.999         | 9.222           | 0.559          | 1.676            | 2.235            |
| 91                       | 0.315          | 1852.039         | 0.0             | 7.511          | 0.259            | 7.770            |

CAL ID NUMBER: 287 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6545898

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 68.738                    | 789.361               | 1.000              | 19.00                   | 21.767             | 249.96               | 87.081                | 275.50            | 0.07901            |
| TAKEOFF                            | 1.000               | 14500.0       | 5.330                     | 8708.711              | 1.000              | 0.70                    | 0.062              | 101.60               | 0.612                 | 169.17            | 0.00037            |
| CLIMBOUT                           | 0.850               | 12325.0       | 4.811                     | 7234.828              | 1.000              | 2.20                    | 0.176              | 265.28               | 0.665                 | 451.92            | 0.00039            |
| APPROACH                           | 0.400               | 5800.0        | 16.201                    | 3590.599              | 1.000              | 4.00                    | 1.080              | 239.37               | 4.512                 | 386.67            | 0.00279            |
| TAXI-IDLE                          | 0.060               | 870.0         | 68.738                    | 789.361               | 1.000              | 7.00                    | 8.019              | 92.09                | 87.081                | 101.50            | 0.07901            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 31.105             | 948.31               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 32.801             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 22.463             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.429              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 11.397                    | 789.361               | 1.000              | 19.00                   | 3.609              | 249.96               | 14.438                | 275.50            | 0.01310            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.172                     | 8708.711              | 1.000              | 0.70                    | 0.002              | 101.60               | 0.020                 | 169.17            | 0.00001            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.221                     | 7234.828              | 1.000              | 2.20                    | 0.008              | 265.28               | 0.031                 | 451.92            | 0.00002            |
| APPROACH                           | 0.400               | 5800.0        | 0.208                     | 3590.599              | 1.000              | 4.00                    | 0.014              | 239.37               | 0.058                 | 386.67            | 0.00004            |
| TAXI-IDLE                          | 0.060               | 870.0         | 11.397                    | 789.361               | 1.000              | 7.00                    | 1.330              | 92.09                | 14.438                | 101.50            | 0.01310            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.963              | 948.31               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.233              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.584              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.138              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.393                     | 789.361               | 1.000              | 19.00                   | 0.441               | 249.96               | 1.764                 | 275.50            | 0.00160            |
| TAKEOFF                            | 1.000               | 14500.0       | 130.491                   | 8708.711              | 1.000              | 0.70                    | 1.522               | 101.60               | 14.984                | 169.17            | 0.00900            |
| CLIMBOUT                           | 0.850               | 12325.0       | 90.110                    | 7234.828              | 1.000              | 2.20                    | 3.304               | 265.28               | 12.455                | 451.92            | 0.00731            |
| APPROACH                           | 0.400               | 5800.0        | 18.647                    | 3590.599              | 1.000              | 4.00                    | 1.243               | 239.37               | 5.193                 | 386.67            | 0.00321            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.393                     | 789.361               | 1.000              | 7.00                    | 0.162               | 92.09                | 1.764                 | 101.50            | 0.00160            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.673               | 948.31               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.037               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.819               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 104.993             |                      |                       |                   |                    |

DATE: 7/29/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: TWA

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 288 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P674266B

RATED THRUST: 14500.

ENGINE TOTAL TIME: 4078. HRS

TIME SINCE HOT SECTION OVERHAUL: 2945. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 4078. HRS  
N2 COMPRESSOR OVERHAUL: 4078. HRS  
COMBUSTOR CAN REPLACEMENT: 2945. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 2945. HRS  
N1 TURBINE OVERHAUL: 4078. HRS  
N2 TURBINE OVERHAUL: 4078. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 63.00 FINISH 63.00

ATMOSPHERIC PRESSURE: START 29.02 FINISH 29.02

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0107

RELATIVE HUMIDITY: 86.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

ENGINE EQUIPPED WITH SMOKELESS BURNER CANS. NO2 DETERMINED BY SUBTRACTION.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9700.00            | 66                       | 7130.00            | 10710.00         | 5470.00                  | 119.00                  | 0.012800 | -0.00                               | 1.65                      | -0.00                        |
| 10.00        | 2/ 1      | 12000.00           | 87                       | 7640.00            | 11100.00         | 6840.00                  | 135.80                  | 0.014000 | -0.00                               | 1.86                      | -0.00                        |
| 20.00        | 3/ 2      | 13840.00           | 95                       | 8090.00            | 11420.00         | 8130.00                  | 149.30                  | 0.015100 | -0.00                               | 2.02                      | -0.00                        |
| 25.00        | 4/ 3      | 880.00             | 6                        | 2570.00            | 6950.00          | 910.00                   | 32.40                   | 0.007800 | -0.00                               | -0.00                     | -0.00                        |
| 31.00        | 5/ 4      | 13360.00           | 92                       | 7960.00            | 11260.00         | 7770.00                  | 146.50                  | 0.014700 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SNOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 66                       | 838.00                     | 9.20                      | 12.00         | 2.59                 | 0.0            | 65.00         | 3.00            | 68.00           | -0.00     | -0.00 | -0.00        |
| 87                       | 898.00                     | 12.00                     | 9.00          | 2.81                 | 0.0            | 90.00         | 4.00            | 94.00           | -0.00     | -0.00 | -0.00        |
| 95                       | 961.00                     | 14.50                     | 6.00          | 2.97                 | 0.0            | 117.00        | 5.00            | 122.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 682.00                     | 0.60                      | 285.00        | 1.62                 | 120.00         | 6.00          | 7.00            | 13.00           | -0.00     | -0.00 | -0.00        |
| 92                       | 941.00                     | 13.70                     | 6.00          | 2.94                 | 0.0            | 107.00        | 7.00            | 114.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 66                       | 0.92                      | 0.0                       | 0.38                       | 3131.79                    | 8.22                      | 8.60                       | 5.05              | 0.0               | 2.07               | 17130.89           | 44.94             | 47.02              |
| 87                       | 0.64                      | 0.0                       | 0.47                       | 3132.24                    | 10.49                     | 10.95                      | 4.37              | 0.0               | 3.19               | 21424.50           | 71.73             | 74.92              |
| 95                       | 0.40                      | 0.0                       | 0.55                       | 3132.61                    | 12.90                     | 13.45                      | 3.27              | 0.0               | 4.48               | 25468.10           | 104.88            | 109.37             |
| 6                        | 14.23                     | 8.25                      | 1.38                       | 3056.82                    | 1.19                      | 2.56                       | 31.15             | 7.51              | 1.26               | 2781.71            | 1.08              | 2.33               |
| 92                       | 0.41                      | 0.0                       | 0.78                       | 3132.60                    | 11.92                     | 12.70                      | 3.16              | 0.0               | 6.06               | 24340.31           | 92.61             | 98.67              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 66                       | 0.571          | 1766.071         | 0.0             | 4.633          | 0.214            | 4.947            |
| 87                       | 0.364          | 1785.375         | 0.0             | 5.978          | 0.266            | 6.244            |
| 95                       | 0.237          | 1840.181         | 0.0             | 7.578          | 0.374            | 7.902            |
| 6                        | 35.193         | 3161.030         | 8.535           | 1.224          | 1.428            | 2.652            |
| 92                       | 0.237          | 1821.880         | 0.0             | 6.932          | 0.453            | 7.395            |

CAL ID NUMBER: 288 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6742668  
 TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 33.905                    | 817.096               | 1.000              | 19.00                   | 10.736             | 258.75               | 41.494                | 275.50            | 0.03897            |
| TAKEOFF                            | 1.000               | 14500.0       | 2.840                     | 8499.000              | 1.000              | 0.70                    | 0.033              | 99.15                | 0.334                 | 169.17            | 0.00020            |
| CLIMBOUT                           | 0.850               | 12325.0       | 3.938                     | 7098.379              | 1.000              | 2.20                    | 0.144              | 260.27               | 0.555                 | 451.92            | 0.00032            |
| APPROACH                           | 0.400               | 5800.0        | 9.291                     | 2975.971              | 1.000              | 4.00                    | 0.619              | 198.40               | 3.122                 | 386.67            | 0.00160            |
| TAXI-IDLE                          | 0.060               | 870.0         | 33.905                    | 817.096               | 1.000              | 7.00                    | 3.956              | 95.33                | 41.494                | 101.50            | 0.03897            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.489             | 911.90               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.985             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.185             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.229              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 7.559                     | 817.096               | 1.000              | 19.00                   | 2.394              | 258.75               | 9.251                 | 275.50            | 0.00869            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.170                     | 8499.000              | 1.000              | 0.70                    | 0.002              | 99.15                | 0.020                 | 169.17            | 0.00001            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.142                     | 7098.379              | 1.000              | 2.20                    | 0.005              | 260.27               | 0.020                 | 451.92            | 0.00001            |
| APPROACH                           | 0.400               | 5800.0        | 0.227                     | 2975.971              | 1.000              | 4.00                    | 0.015              | 198.40               | 0.076                 | 386.67            | 0.00004            |
| TAXI-IDLE                          | 0.060               | 870.0         | 7.559                     | 817.096               | 1.000              | 7.00                    | 0.882              | 95.33                | 9.251                 | 101.50            | 0.00869            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.298              | 911.90               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.616              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.382              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.137              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.888                     | 817.096               | 1.000              | 19.00                   | 0.598               | 258.75               | 2.310                 | 275.50            | 0.00217            |
| TAKENFF                            | 1.000               | 14500.0       | 125.981                   | 8499.000              | 1.000              | 0.70                    | 1.470               | 99.15                | 14.823                | 169.17            | 0.00869            |
| CLIMBOUT                           | 0.850               | 12325.0       | 80.093                    | 7098.379              | 1.000              | 2.20                    | 2.937               | 260.27               | 11.283                | 451.92            | 0.00650            |
| APPROACH                           | 0.400               | 5800.0        | 17.350                    | 2975.971              | 1.000              | 4.00                    | 1.157               | 198.40               | 5.830                 | 386.67            | 0.00299            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.888                     | 817.096               | 1.000              | 7.00                    | 0.220               | 95.33                | 2.310                 | 101.50            | 0.00217            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.381               | 911.90               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.998               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.608               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 101.364             |                      |                       |                   |                    |

DATE: 8/ 3/71

TEST ORGANIZATION: S W R T TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 303 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6743798  
RATED THRUST: 14500.

ENGINE TOTAL TIME: 3686. HRS

TIME SINCE HOT SECTION OVERHAUL: 460. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 3686. HRS  
N2 COMPRESSOR OVERHAUL: 3686. HRS  
COMBUSTOR CAN REPLACEMENT: 460. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3686. HRS  
N1 TURBINE OVERHAUL: 3686. HRS  
N2 TURBINE OVERHAUL: 3686. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 28.97 FINISH 28.67

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0129

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

N02 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS. THIS TEST AND TEST CAL NO. 304 WERE RUN ON THE SAME JT8D-9 ENGINE. TEST 303 WAS RUN WITH NO SMOKE ELIMINATOR (ETHYL CJ-2) IN THE FUEL AND TEST 304 WAS RUN WITH FUEL CONTAINING THE NORMAL CONCENTRATION OF C1-2 (0.1% BY VOLUME)

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9640.00            | 66                       | 7250.00            | 10880.00         | 5540.00                  | 116.50                  | 0.013200 | -0.00                               | -0.00                     | -0.00                        |
| 5.00         | 2/ 1      | 11820.00           | 81                       | 7730.00            | 11210.00         | 6840.00                  | 132.20                  | 0.014400 | -0.00                               | -0.00                     | -0.00                        |
| 10.00        | 3/ 2      | 13780.00           | 95                       | 8260.00            | 11570.00         | 8220.00                  | 147.40                  | 0.015500 | -0.00                               | -0.00                     | -0.00                        |
| 15.00        | 4/ 3      | 900.00             | 6                        | 2710.00            | 6960.00          | 880.00                   | 32.30                   | 0.007600 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 66                       | 880.00                     | 9.00                      | 11.00         | 2.69                 | 0.0            | 62.00         | 5.00            | 67.00           | -0.00     | -0.00 | -0.00        |
| 81                       | 945.00                     | 11.90                     | 12.00         | 2.93                 | 0.0            | 86.00         | 4.00            | 90.00           | -0.00     | -0.00 | -0.00        |
| 95                       | 1018.00                    | 14.50                     | 11.00         | 3.14                 | 0.0            | 119.00        | 6.00            | 125.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 680.00                     | 0.60                      | 318.00        | 1.60                 | 167.00         | 5.00          | 7.00            | 12.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/IK LB FUEL | MASS EMI HC LB/IK LB FUEL | MASS EMI NO2 LB/IK LB FUEL | MASS EMI CO2 LB/IK LB FUEL | MASS EMI NO LB/IK LB FUEL | MASS EMI NOX LB/IK LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 66                       | 0.82                      | 0.0                       | 0.61                       | 3131.96                    | 7.55                      | 8.15                       | 4.52              | 0.0               | 3.37               | 17351.05           | 41.81             | 45.18              |
| 81                       | 0.82                      | 0.0                       | 0.45                       | 3131.96                    | 9.61                      | 10.06                      | 5.58              | 0.0               | 3.06               | 21422.59           | 65.73             | 68.79              |
| 95                       | 0.70                      | 0.0                       | 0.63                       | 3132.14                    | 12.41                     | 13.03                      | 5.74              | 0.0               | 5.14               | 25746.21           | 102.00            | 107.15             |
| 6                        | 38.47                     | 11.57                     | 1.39                       | 3041.06                    | 0.99                      | 2.38                       | 33.85             | 10.18             | 1.22               | 2676.13            | 0.87              | 2.10               |

| POWER PERCENT RATED T.O. | CO LB/IK#TH-HR | CO 2 LB/IK#TH-HR | THC LB/IK#TH-HR | NO LB/IK#TH-HR | NO 2 LB/IK#TH-HR | NO X LB/IK#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 66                       | 0.468          | 1799.902         | 0.0             | 4.337          | 0.350            | 4.687            |
| 81                       | 0.472          | 1812.402         | 0.0             | 5.561          | 0.259            | 5.820            |
| 95                       | 0.417          | 1868.375         | 0.0             | 7.402          | 0.373            | 7.775            |
| 6                        | 37.613         | 2973.481         | 11.313          | 0.971          | 1.360            | 2.331            |

**SERIAL NUMBER: P674379B**

TEST ORGANIZATION: S W R I TWA

|                                    |        |        |         |
|------------------------------------|--------|--------|---------|
| TOTAL FOR CYCLE:                   | 15.395 | 919.60 | 1384.75 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    | 16.741 |        |         |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   | 11.118 |        |         |
| LBS POLLUTANT/1000K LB TH AT T.O.: | 0.547  |        |         |

|                                    |       |        |         |
|------------------------------------|-------|--------|---------|
| TOTAL FOR CYCLE:                   | 4.390 | 919.60 | 1384.75 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    | 4.774 |        |         |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   | 3.170 |        |         |
| LBS POLLUTANT/1000K LB TH AT T.O.: | 0.0   |        |         |

|                                    |         |        |         |
|------------------------------------|---------|--------|---------|
| TOTAL FOR CYCLE:                   | 6.130   | 919.60 | 1384.75 |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    | 6.666   |        |         |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   | 4.427   |        |         |
| LBS POLLUTANT/1000K LB TH AT T.O.: | 101.735 |        |         |

DATE: 8/ 3/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 304 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6743798

RATED THRUST: 14500.

ENGINE TOTAL TIME: 3686. HRS

TIME SINCE HOT SECTION OVERHAUL: 460. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 3686. HRS  
N2 COMPRESSOR OVERHAUL: 3686. HRS  
COMBUSTOR CAN REPLACEMENT: 460. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3686. HRS  
N1 TURBINE OVERHAUL: 3686. HRS  
N2 TURBINE OVERHAUL: 3686. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 28.97 FINISH 28.97

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0129

RELATIVE HUMIDITY: 54.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.0C, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS. FUEL CONTAINS THE 'NORMAL' CONCENTRATION OF CI-2 SMOKE SUPPRESSANT (0.1% BY VOLUME). THIS IS THE SAME ENGINE TESTED DURING TEST CAL NO. 303.

| ELAPSED TIME | TFST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 9700.00            | 66                       | 7250.00          | 5480.00                  | 116.70                  | 0.013000 | -0.00                               | -0.00                     | -0.00                        |
| 3.30         | 2/ 1      | 11900.00           | 82                       | 7790.00          | 6910.00                  | 132.90                  | 0.014400 | -0.00                               | -0.00                     | -0.00                        |
| 8.00         | 3/ 2      | 11740.00           | 94                       | 8260.00          | 5300.00                  | 146.60                  | 0.015700 | -0.00                               | -0.00                     | -0.00                        |
| 13.00        | 4/ 3      | 900.00             | 6                        | 2720.00          | 890.00                   | 32.30                   | 0.007600 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 66                       | 878.00                     | 9.00                      | 26.00         | 2.66                 | 0.0            | 61.00         | 5.00            | 66.00           | -0.00     | -0.00 | -0.00        |
| 82                       | 950.00                     | 11.90                     | 19.00         | 2.98                 | 0.0            | 89.00         | 2.00            | 91.00           | -0.00     | -0.00 | -0.00        |
| 94                       | 1031.00                    | 14.30                     | 15.00         | 3.20                 | 0.0            | 119.00        | 4.00            | 123.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 685.00                     | 0.60                      | 345.00        | 1.59                 | 194.00         | 5.00          | 7.00            | 129.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CN LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 66                       | 1.95                      | 0.0                       | 0.62                       | 3130.18                    | 7.50                      | 8.12                       | 10.67             | 0.0               | 3.37               | 17153.39           | 41.12             | 44.49              |
| 82                       | 1.27                      | 0.0                       | 0.22                       | 3131.24                    | 9.78                      | 10.00                      | 8.78              | 0.0               | 1.52               | 21636.89           | 67.55             | 69.07              |
| 94                       | 0.93                      | 0.0                       | 0.41                       | 3131.77                    | 17.18                     | 12.58                      | 4.95              | 0.0               | 2.17               | 16598.39           | 64.53             | 66.70              |
| 6                        | 41.85                     | 13.48                     | 1.39                       | 3030.51                    | 1.00                      | 25.70                      | 37.25             | 12.00             | 1.24               | 2697.15            | 0.89              | 22.88              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 66                       | 1.100          | 1768.391         | 0.0             | 4.239          | 0.347            | 4.587            |
| 82                       | 0.738          | 1818.226         | 0.0             | 5.677          | 0.128            | 5.804            |
| 94                       | 0.360          | 1208.034         | 0.0             | 4.696          | 0.158            | 4.854            |
| 6                        | 41.385         | 2996.838         | 13.328          | 0.985          | 1.379            | 25.418           |

CAL ID NUMBER: 304 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6743798

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 32.009                    | 781.719               | 1.000              | 19.00                   | 10.136             | 247.54               | 40.947                | 275.50            | 0.03679            |
| TAKEOFF                            | 1.000               | 14500.0       | 9.190                     | 8561.344              | 1.000              | 0.70                    | 0.107              | 99.88                | 1.073                 | 169.17            | 0.00063            |
| CLIMBOUT                           | 0.850               | 12325.0       | 10.375                    | 7169.719              | 1.000              | 2.20                    | 0.380              | 262.89               | 1.447                 | 451.92            | 0.00084            |
| APPROACH                           | 0.400               | 5800.0        | 15.135                    | 3286.938              | 1.000              | 4.00                    | 1.009              | 219.13               | 4.605                 | 386.67            | 0.00261            |
| TAXI-IDLE                          | 0.060               | 870.0         | 32.009                    | 781.719               | 1.000              | 7.00                    | 3.734              | 91.20                | 40.947                | 101.50            | 0.03679            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.367             | 920.65               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.692             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.098             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.739              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 11.374                    | 781.719               | 1.000              | 19.00                   | 3.602              | 247.54               | 14.550                | 275.50            | 0.01307            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.0                       | 8561.344              | 1.000              | 0.70                    | 0.0                | 99.88                | 0.0                   | 169.17            | 0.0                |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.0                       | 7169.719              | 1.000              | 2.20                    | 0.0                | 262.89               | 0.0                   | 451.92            | 0.0                |
| APPROACH                           | 0.400               | 5800.0        | 1.014                     | 3286.938              | 1.000              | 4.00                    | 0.068              | 219.13               | 0.309                 | 386.67            | 0.00017            |
| TAXI-IDLE                          | 0.060               | 870.0         | 11.374                    | 781.719               | 1.000              | 7.00                    | 1.327              | 91.20                | 14.550                | 101.50            | 0.01307            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.996              | 920.65               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.427              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.608              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 3.594                     | 781.719               | 1.000              | 19.00                   | 1.138               | 247.54               | 4.598                 | 275.50            | 0.00413            |
| TAKEOFF                            | 1.000               | 14500.0       | 234.290                   | 8561.344              | 1.000              | 0.70                    | 2.733               | 99.88                | 27.366                | 169.17            | 0.01616            |
| CLIMBOUT                           | 0.850               | 12325.0       | 151.259                   | 7169.719              | 1.000              | 2.20                    | 5.546               | 262.89               | 21.097                | 451.92            | 0.01227            |
| APPROACH                           | 0.400               | 5800.0        | 35.232                    | 3286.938              | 1.000              | 4.00                    | 2.349               | 219.13               | 10.719                | 386.67            | 0.00607            |
| TAXI-IDLE                          | 0.060               | 870.0         | 3.594                     | 781.719               | 1.000              | 7.00                    | 0.419               | 91.20                | 4.598                 | 101.50            | 0.00413            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.186              | 920.65               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.236              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.800               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 188.509             |                      |                       |                   |                    |

DATE: 7/13/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 305 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P6742998

RATED THRUST: 14500.

ENGINE TOTAL TIME: 3674. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 3674. HRS  
 N2 COMPRESSOR OVERHAUL: 3674. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 3674. HRS  
 N2 TURBINE OVERHAUL: 3674. HRS

FUEL: JP-4 TF

FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 28.92 FINISH 28.92

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0152

RELATIVE HUMIDITY: 68.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

N02 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| FLASPED<br>TIME | TEST<br>MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 1/ 0         | 9450.00                  | 65                                | 7160.00 10830.00                | 5470.00                           | 115.10                        | 0.013200    | -0.00                                        | 1.65                               | -0.00                                 |
| 5.00            | 2/ 1         | 11320.00                 | 78                                | 7550.00 11160.00                | 6520.00                           | 128.50                        | 0.014100    | -0.00                                        | 1.81                               | -0.00                                 |
| 11.30           | 3/ 2         | 13400.00                 | 92                                | 8060.00 11480.00                | 7850.00                           | 144.10                        | 0.015300    | -0.00                                        | 2.02                               | -0.00                                 |
| 16.30           | 4/ 3         | 10200.00                 | 7                                 | 2850.00 7120.00                 | 1190.00                           | 34.10                         | 0.009700    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 895.00                              | 9.10                               | 26.00               | 2.65                          | 1.90                 | 63.00               | 6.00                     | 69.00                    | -0.00     | -0.00 | -0.00        |
| 78                                | 941.00                              | 11.30                              | 20.00               | 2.80                          | 0.0                  | 85.00               | 4.00                     | 89.00                    | -0.00     | -0.00 | -0.00        |
| 92                                | 1009.00                             | 14.10                              | 17.00               | 3.05                          | 0.0                  | 120.00              | 8.00                     | 128.00                   | -0.00     | -0.00 | -0.00        |
| 7                                 | 681.00                              | 0.60                               | 305.00              | 1.85                          | 94.00                | 2.00                | 8.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 65                                | 1.95                               | 0.04                               | 0.74                                | 3130.05                             | 7.78                               | 8.52                                | 10.69                   | 0.24                    | 4.05                     | 17121.39                 | 42.55                   | 46.60                    |
| 78                                | 1.42                               | 0.0                                | 0.47                                | 3131.00                             | 9.94                               | 10.40                               | 9.28                    | 0.0                     | 3.05                     | 20414.14                 | 64.78                   | 67.83                    |
| 92                                | 1.11                               | 0.0                                | 0.86                                | 3131.50                             | 12.88                              | 13.74                               | 8.72                    | 0.0                     | 4.74                     | 24582.25                 | 101.11                  | 107.85                   |
| 7                                 | 32.18                              | 5.68                               | 1.39                                | 3067.09                             | 0.35                               | 1.73                                | 38.30                   | 6.76                    | 1.65                     | 3649.84                  | 0.41                    | 2.06                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 1.131             | 1811.787               | 0.025              | 4.503             | 0.429                  | 4.932                  |
| 78                                | 0.820             | 1803.369               | 0.0                | 5.723             | 0.269                  | 5.992                  |
| 92                                | 0.651             | 1834.496               | 0.0                | 7.545             | 0.503                  | 8.048                  |
| 7                                 | 17.546            | 3578.274               | 6.627              | 0.404             | 1.618                  | 2.322                  |

CAL ID NUMBER: 305 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S W R I TWA

SERIAL NUMBER: P6742998

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 51.007                    | 1082.793              | 1.000              | 19.00                   | 16.152             | 342.88               | 47.107                | 275.50            | 0.05863            |
| TAKEOFF                            | 1.000               | 14500.0       | 8.538                     | 8559.730              | 1.000              | 0.70                    | 0.100              | 99.86                | 0.997                 | 169.17            | 0.00059            |
| CLIMBOUT                           | 0.850               | 12325.0       | 9.274                     | 7168.734              | 1.000              | 2.20                    | 0.340              | 262.85               | 1.294                 | 451.92            | 0.00075            |
| APPROACH                           | 0.400               | 5800.0        | 15.276                    | 3523.386              | 1.000              | 4.00                    | 1.018              | 234.89               | 4.336                 | 386.67            | 0.00263            |
| TAXI-IDLE                          | 0.060               | 870.0         | 51.007                    | 1082.793              | 1.000              | 7.00                    | 5.951              | 126.33               | 47.107                | 101.50            | 0.05863            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 23.561             | 1066.82              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 22.085             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 17.015             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.687              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 7.703                     | 1082.793              | 1.000              | 19.00                   | 2.439              | 342.88               | 7.114                 | 275.50            | 0.00885            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.309                     | 8559.730              | 1.000              | 0.70                    | 0.004              | 99.86                | 0.036                 | 169.17            | 0.00002            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.359                     | 7168.734              | 1.000              | 2.20                    | 0.013              | 262.85               | 0.050                 | 451.92            | 0.00003            |
| APPROACH                           | 0.400               | 5800.0        | 1.227                     | 3523.386              | 1.000              | 4.00                    | 0.082              | 234.89               | 0.348                 | 386.67            | 0.00021            |
| TAXI-IDLE                          | 0.060               | 870.0         | 7.703                     | 1082.793              | 1.000              | 7.00                    | 0.899              | 126.33               | 7.114                 | 101.50            | 0.00885            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.437              | 1066.82              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.221              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.482              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.249              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.816                     | 1082.793              | 1.000              | 19.00                   | 0.575               | 342.88               | 1.677                 | 275.50            | 0.00209            |
| TAKEOFF                            | 1.000               | 14500.0       | 137.944                   | 8559.730              | 1.000              | 0.70                    | 1.609               | 99.86                | 16.115                | 169.17            | 0.00951            |
| CLIMBOUT                           | 0.850               | 12325.0       | 85.093                    | 7168.734              | 1.000              | 2.20                    | 3.120               | 262.85               | 11.870                | 451.92            | 0.00690            |
| APPROACH                           | 0.400               | 5800.0        | 17.923                    | 3523.386              | 1.000              | 4.00                    | 1.195               | 234.89               | 5.087                 | 386.67            | 0.00309            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.816                     | 1082.793              | 1.000              | 7.00                    | 0.212               | 126.33               | 1.677                 | 101.50            | 0.00209            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.711               | 1066.82              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.291               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.847               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 110.989             |                      |                       |                   |                    |

DATE: 8/ 6/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 330 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P665408B

RATED THRUST: 14500.

ENGINE TOTAL TIME: 6025. HRS

TIME SINCE HOT SECTION OVERHAUL: 2937. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 6025. HRS

N2 COMPRESSOR OVERHAUL: 6025. HRS

COMBUSTOR CAN REPLACEMENT: 2937. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 2937. HRS

N1 TURBINE OVERHAUL: 6025. HRS

N2 TURBINE OVERHAUL: 6025. HRS

FUEL: JP-4 TF

FUEL H/C RATIO: 1.722

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPRATURE, DEGREES F: START 65.00 FINISH 65.00

ATMOSPHERIC PRESSURE: START 29.12 FINISH 29.12

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0113

RELATIVE HUMIDITY: 83.00 PERCENT

SAMPLE LINE: TEMPRATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

NO 2 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.

| FLASPED<br>TIME | TEST<br>MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|--------------------------|-----------------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 4/ 0         | 880.00                   | 6                                 | 2730.00                | 6840.00                           | 930.00                        | 0.007900    | -0.00                                        | -0.00                              | -0.00                                 |
| 6.00            | 7/ 4         | 1850.00                  | 12                                | 3800.00                | 8230.00                           | 1570.00                       | 0.009200    | -0.00                                        | -0.00                              | -0.00                                 |
| 9.00            | 8/ 7         | 2960.00                  | 20                                | 4660.00                | 8920.00                           | 1840.00                       | 0.008600    | -0.00                                        | -0.00                              | -0.00                                 |
| 12.00           | 9/ 8         | 4090.00                  | 28                                | 5310.00                | 9450.00                           | 2420.00                       | 0.009400    | -0.00                                        | -0.00                              | -0.00                                 |
| 14.30           | 10/ 9        | 5180.00                  | 35                                | 5780.00                | 9780.00                           | 2950.00                       | 0.010000    | -0.00                                        | -0.00                              | -0.00                                 |
| 16.00           | 11/10        | 9640.00                  | 66                                | 7580.00                | 10680.00                          | 5540.00                       | 0.013000    | -0.00                                        | -0.00                              | -0.00                                 |
| 19.30           | 2/ 1         | 11380.00                 | 78                                | 7710.00                | 10740.00                          | 6510.00                       | 0.013800    | -0.00                                        | -0.00                              | -0.00                                 |
| 22.00           | 3/ 2         | 13910.00                 | 95                                | 8190.00                | 11400.00                          | 8370.00                       | 0.015500    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 6                                 | 666.00                              | 0.60                               | 362.00              | 1.65                          | 140.00               | 11.00               | 2.00                     | 13.00                    | -0.00     | -0.00 | -0.00        |
| 12                                | 698.00                              | 1.30                               | 169.00              | 1.91                          | 22.00                | 17.00               | 5.00                     | 22.00                    | -0.00     | -0.00 | -0.00        |
| 20                                | 610.00                              | 2.30                               | 88.00               | 1.80                          | 13.00                | 18.00               | 3.00                     | 21.00                    | -0.00     | -0.00 | -0.00        |
| 28                                | 648.00                              | 3.30                               | 55.00               | 1.94                          | 4.00                 | 22.00               | 7.00                     | 29.00                    | -0.00     | -0.00 | -0.00        |
| 35                                | 685.00                              | 4.30                               | 29.00               | 2.07                          | 2.00                 | 29.00               | 6.00                     | 35.00                    | -0.00     | -0.00 | -0.00        |
| 66                                | 851.00                              | 9.40                               | 18.00               | 2.65                          | 0.0                  | 62.00               | 5.00                     | 67.00                    | -0.00     | -0.00 | -0.00        |
| 78                                | 900.00                              | 11.30                              | 11.00               | 2.80                          | 0.0                  | 76.00               | 5.00                     | 81.00                    | -0.00     | -0.00 | -0.00        |
| 95                                | 993.00                              | 14.70                              | 6.00                | 3.14                          | 0.0                  | 111.00              | 8.00                     | 119.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CU2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 6                                 | 43.39                              | 9.61                               | 0.39                                | 3107.18                             | 7.17                               | 2.55                                | 40.35                   | 8.94                    | 0.37                     | 2889.68                  | 2.01                    | 2.38                     |
| 12                                | 17.85                              | 1.33                               | 0.87                                | 3170.01                             | 2.95                               | 3.82                                | 28.03                   | 2.09                    | 1.36                     | 4976.92                  | 4.63                    | 5.99                     |
| 20                                | 9.91                               | 0.84                               | 0.55                                | 3183.85                             | 3.33                               | 3.88                                | 18.23                   | 1.54                    | 1.02                     | 5858.27                  | 6.12                    | 7.14                     |
| 28                                | 5.76                               | 0.24                               | 1.20                                | 3192.00                             | 3.78                               | 4.99                                | 13.94                   | 0.58                    | 2.91                     | 7724.64                  | 9.16                    | 12.07                    |
| 35                                | 2.85                               | 0.11                               | 0.97                                | 3196.93                             | 4.68                               | 5.65                                | 8.41                    | 0.33                    | 2.86                     | 9430.93                  | 13.81                   | 16.67                    |
| 66                                | 1.38                               | 0.0                                | 0.63                                | 3199.54                             | 7.83                               | 8.46                                | 7.66                    | 0.0                     | 3.50                     | 17725.44                 | 43.35                   | 46.85                    |
| 78                                | 0.80                               | 0.0                                | 0.60                                | 3200.45                             | 9.08                               | 9.68                                | 5.21                    | 0.0                     | 3.89                     | 20834.94                 | 59.12                   | 63.01                    |
| 95                                | 0.39                               | 0.0                                | 0.85                                | 3201.10                             | 11.83                              | 12.68                               | 3.26                    | 0.0                     | 7.14                     | 26793.20                 | 99.01                   | 106.15                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 6                                 | 45.851            | 3283.722               | 10.156             | 2.299             | 0.416                  | 2.705                  |
| 12                                | 15.150            | 2640.227               | 1.129              | 2.503             | 0.736                  | 3.234                  |
| 20                                | 6.158             | 1979.147               | 0.521              | 2.069             | 0.345                  | 2.414                  |
| 28                                | 3.408             | 1898.666               | 0.142              | 2.239             | 0.712                  | 2.951                  |
| 35                                | 1.623             | 1820.643               | 0.064              | 2.666             | 0.552                  | 3.218                  |
| 66                                | 0.795             | 1838.739               | 0.0                | 4.497             | 0.363                  | 4.860                  |
| 78                                | 0.458             | 1830.838               | 0.0                | 5.195             | 0.342                  | 5.537                  |
| 95                                | 0.234             | 1926.183               | 0.0                | 7.118             | 0.513                  | 7.631                  |

CAL ID NUMBER: 330 ENGINE TYPE AND MODEL: JT8D-9  
TEST ORGANIZATION: S M R I TWA

SERIAL NUMBER: P6694088

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 34.122                    | 790.021               | 1.000              | 19.00                   | 10.805             | 250.17               | 43.191                | 275.50            | 0.03922            |
| TAKEOFF                            | 1.000               | 14500.0       | 5.126                     | 8727.305              | 1.000              | 0.70                    | 0.060              | 101.82               | 0.587                 | 169.17            | 0.00035            |
| CLIMBOUT                           | 0.850               | 12325.0       | 6.353                     | 7091.418              | 1.000              | 2.20                    | 0.233              | 260.02               | 0.896                 | 451.92            | 0.00052            |
| APPROACH                           | 0.400               | 5800.0        | 9.212                     | 3378.473              | 1.000              | 4.00                    | 0.614              | 225.23               | 2.727                 | 386.67            | 0.00159            |
| TAXI-IDLE                          | 0.060               | 870.0         | 34.122                    | 790.021               | 1.000              | 7.00                    | 3.981              | 92.17                | 43.191                | 101.50            | 0.03922            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.693             | 929.41               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.885             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.333             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.412              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 6.683                     | 790.021               | 1.000              | 19.00                   | 2.116              | 250.17               | 8.459                 | 275.50            | 0.00768            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.166                     | 8727.305              | 1.000              | 0.70                    | 0.002              | 101.82               | 0.019                 | 169.17            | 0.00001            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.218                     | 7091.418              | 1.000              | 2.20                    | 0.008              | 260.02               | 0.031                 | 451.92            | 0.00002            |
| APPROACH                           | 0.400               | 5800.0        | 0.289                     | 3378.473              | 1.000              | 4.00                    | 0.019              | 225.23               | 0.086                 | 386.67            | 0.00005            |
| TAXI-IDLE                          | 0.060               | 870.0         | 6.683                     | 790.021               | 1.000              | 7.00                    | 0.780              | 92.17                | 8.459                 | 101.50            | 0.00768            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.925              | 929.41               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.147              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.112              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.134              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.093                     | 790.021               | 1.000              | 19.00                   | 0.663               | 250.17               | 2.649                 | 275.50            | 0.00241            |
| TAKEOFF                            | 1.000               | 14500.0       | 117.144                   | 8727.305              | 1.000              | 0.70                    | 1.367               | 101.82               | 13.423                | 169.17            | 0.00808            |
| CLIMBOUT                           | 0.850               | 12325.0       | 77.195                    | 7091.418              | 1.000              | 2.20                    | 2.830               | 260.02               | 10.886                | 451.92            | 0.00626            |
| APPROACH                           | 0.400               | 5800.0        | 19.496                    | 3378.473              | 1.000              | 4.00                    | 1.300               | 225.23               | 5.771                 | 386.67            | 0.00336            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.093                     | 790.021               | 1.000              | 7.00                    | 0.244               | 92.17                | 2.649                 | 101.50            | 0.00241            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.404               | 929.41               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.890               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.625               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 94.253              |                      |                       |                   |                    |

DATE: 8/ 9/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL IO NUMBER: 332 ENGINE TYPE AND MODEL: JT8D-9

SERIAL NUMBER: P665704R

RATED THRUST: 14500.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4 TF

FUEL H/C RATIO: 1.722

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 29.05 FINISH 29.05

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0121

RELATIVE HUMIDITY: 41.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

N02 DETERMINED BY SUBTRACTION. ENGINE EQUIPPED WITH SMOKELESS BURNER CANS.  
THIS ENGINE WAS NEW, AND WAS USED AS A CALIBRATION ENGINE TO CHECK TWA'S TEST  
CELLS AGAINST PRATT & WHITNEY'S.

| FLASPED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 0.0             | 1/ 0         | 9500.00                           | 65                       | 7330.00                | 10980.00                          | 5410.00                       | 114.90      | 0.013100                                     | -0.00                              | -0.00                                 |
| 6.00            | 2/ 1         | 11500.00                          | 79                       | 7660.00                | 11300.00                          | 6620.00                       | 129.00      | 0.014200                                     | -0.00                              | -0.00                                 |
| 8.00            | 3/ 2         | 13450.00                          | 92                       | 8170.00                | 11650.00                          | 8020.00                       | 143.80      | 0.015500                                     | -0.00                              | -0.00                                 |
| 12.00           | 4/ 3         | 880.00                            | 6                        | 2720.00                | 6900.00                           | 930.00                        | 32.20       | 0.008000                                     | -0.00                              | -0.00                                 |
| 17.00           | 7/ 4         | 1260.00                           | 8                        | 3280.00                | 7650.00                           | 1260.00                       | 36.90       | 0.009500                                     | -0.00                              | -0.00                                 |
| 23.00           | 8/ 7         | 1500.00                           | 10                       | 3530.00                | 7990.00                           | 1400.00                       | 39.70       | 0.009800                                     | -0.00                              | -0.00                                 |
| 25.00           | 9/ 8         | 1760.00                           | 12                       | 3780.00                | 8280.00                           | 1540.00                       | 43.50       | 0.009800                                     | -0.00                              | -0.00                                 |
| 29.00           | 10/ 9        | 3000.00                           | 20                       | 4780.00                | 9130.00                           | 1920.00                       | 58.70       | 0.009300                                     | -0.00                              | -0.00                                 |
| 34.00           | 11/10        | 5020.00                           | 34                       | 5820.00                | 9950.00                           | 2940.00                       | 79.00       | 0.010300                                     | -0.00                              | -0.00                                 |
| 39.00           | 12/11        | 7000.00                           | 48                       | 6550.00                | 10480.00                          | 3990.00                       | 96.10       | 0.011500                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 876.00                              | 9.00                               | 15.30               | 2.67                          | 1.00                 | 66.00               | 5.00                     | 71.00                    | -0.00     | -0.00 | -0.00        |
| 79                                | 960.00                              | 11.30                              | 11.00               | 2.85                          | 0.0                  | 85.00               | 5.00                     | 90.00                    | -0.00     | -0.00 | -0.00        |
| 92                                | 1074.00                             | 14.10                              | 8.00                | 3.14                          | 0.0                  | 116.00              | 5.00                     | 121.00                   | -0.00     | -0.00 | -0.00        |
| 6                                 | 712.00                              | 0.60                               | 310.00              | 1.65                          | 113.00               | 11.00               | 1.00                     | 12.00                    | -0.00     | -0.00 | -0.00        |
| 8                                 | 759.00                              | 0.80                               | 234.00              | 1.96                          | 88.00                | 13.00               | 2.00                     | 15.00                    | -0.00     | -0.00 | -0.00        |
| 10                                | 770.00                              | 1.10                               | 192.00              | 1.96                          | 60.00                | 16.00               | 1.00                     | 17.00                    | -0.00     | -0.00 | -0.00        |
| 12                                | 772.00                              | 1.10                               | 162.00              | 1.99                          | 46.00                | 18.00               | 2.00                     | 20.00                    | -0.00     | -0.00 | -0.00        |
| 20                                | 667.00                              | 2.30                               | 86.00               | 1.92                          | 31.00                | 19.00               | 2.00                     | 21.00                    | -0.00     | -0.00 | -0.00        |
| 34                                | 718.00                              | 4.10                               | 41.00               | 2.11                          | 10.00                | 28.00               | 4.00                     | 32.00                    | -0.00     | -0.00 | -0.00        |
| 48                                | 770.00                              | 6.20                               | 25.00               | 2.34                          | 4.00                 | 43.00               | 5.00                     | 48.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 65                                | 1.14                               | 0.04                               | 0.63                                | 3199.80                             | 8.27                               | 8.90                                | 6.19                    | 0.24                    | 3.39                     | 17310.84                 | 44.73                   | 48.12                    |
| 79                                | 0.79                               | 0.0                                | 0.59                                | 3200.48                             | 9.98                               | 10.57                               | 5.20                    | 0.0                     | 3.89                     | 21187.15                 | 66.06                   | 69.94                    |
| 92                                | 0.52                               | 0.0                                | 0.53                                | 3200.90                             | 12.36                              | 12.89                               | 4.16                    | 0.0                     | 4.27                     | 25671.18                 | 99.14                   | 103.41                   |
| 6                                 | 17.33                              | 7.79                               | 0.20                                | 3121.69                             | 2.18                               | 2.37                                | 34.71                   | 7.25                    | 0.18                     | 2903.17                  | 2.07                    | 2.21                     |
| 8                                 | 23.93                              | 5.16                               | 0.34                                | 3149.96                             | 2.18                               | 2.52                                | 30.16                   | 6.50                    | 0.42                     | 3968.95                  | 2.75                    | 3.18                     |
| 10                                | 19.71                              | 3.53                               | 0.17                                | 3161.07                             | 2.70                               | 2.87                                | 27.59                   | 4.94                    | 0.24                     | 4425.50                  | 3.78                    | 4.01                     |
| 12                                | 16.42                              | 2.67                               | 0.33                                | 3168.59                             | 3.00                               | 3.33                                | 25.28                   | 4.11                    | 0.51                     | 4879.63                  | 4.61                    | 5.13                     |
| 20                                | 9.07                               | 1.87                               | 0.35                                | 3182.32                             | 3.29                               | 3.64                                | 17.42                   | 3.60                    | 0.67                     | 6110.05                  | 6.37                    | 6.99                     |
| 34                                | 3.95                               | 0.55                               | 0.63                                | 3193.99                             | 4.43                               | 5.06                                | 11.61                   | 1.62                    | 1.86                     | 9390.33                  | 13.03                   | 14.89                    |
| 48                                | 2.17                               | 0.20                               | 0.71                                | 3197.75                             | 6.14                               | 6.86                                | 8.68                    | 0.80                    | 2.85                     | 12759.02                 | 24.51                   | 27.36                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 0.452             | 1822.199               | 0.025              | 4.709             | 0.357                  | 5.066                  |
| 79                                | 0.453             | 1842.361               | 0.0                | 5.744             | 0.338                  | 6.082                  |
| 92                                | 0.309             | 1908.638               | 0.0                | 7.371             | 0.318                  | 7.689                  |
| 6                                 | 39.448            | 3299.053               | 8.236              | 2.299             | 0.209                  | 2.508                  |
| 8                                 | 23.935            | 3149.962               | 5.155              | 2.184             | 0.336                  | 2.520                  |
| 10                                | 18.394            | 2950.333               | 3.292              | 2.518             | 0.157                  | 2.675                  |
| 12                                | 14.165            | 2712.520               | 2.336              | 2.622             | 0.291                  | 2.913                  |
| 20                                | 5.806             | 2036.684               | 1.199              | 2.107             | 0.222                  | 2.329                  |
| 34                                | 2.313             | 1870.584               | 0.323              | 2.595             | 0.371                  | 2.966                  |
| 48                                | 1.739             | 1822.717               | 0.114              | 3.501             | 0.407                  | 3.909                  |

FORM 107-100-000

CAL ID NUMBER: 332 ENGINE TYPE AND MODEL: JT8D-9 SERIAL NUMBER: P6657048  
TEST ORGANIZATION: S W R I TWA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 41.007                    | 1011.297              | 1.000              | 19.00                   | 12.985             | 320.24               | 40.549                | 275.50            | 0.04713            |
| TAKEOFF                            | 1.000               | 14500.0       | 5.372                     | 8804.355              | 1.000              | 0.70                    | 0.063              | 102.72               | 0.610                 | 169.17            | 0.00037            |
| CLIMBOUT                           | 0.850               | 12325.0       | 5.957                     | 7284.480              | 1.000              | 2.20                    | 0.218              | 267.10               | 0.818                 | 451.92            | 0.00048            |
| APPROACH                           | 0.400               | 5800.0        | 11.322                    | 3487.744              | 1.000              | 4.00                    | 0.755              | 232.52               | 3.246                 | 386.67            | 0.00195            |
| TAXI-IDLE                          | 0.060               | 870.0         | 41.007                    | 1011.297              | 1.000              | 7.00                    | 4.784              | 117.98               | 40.549                | 101.50            | 0.04713            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 18.805             | 1040.56              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.072             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.580             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.432              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 8.470                     | 1011.297              | 1.000              | 19.00                   | 2.682              | 320.24               | 8.376                 | 275.50            | 0.00974            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.0                       | 8804.355              | 1.000              | 0.70                    | 0.0                | 102.72               | 0.0                   | 169.17            | 0.0                |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.148                     | 7284.480              | 1.000              | 2.20                    | 0.005              | 267.10               | 0.020                 | 451.92            | 0.00001            |
| APPROACH                           | 0.400               | 5800.0        | 1.597                     | 3487.744              | 1.000              | 4.00                    | 0.106              | 232.52               | 0.458                 | 386.67            | 0.00028            |
| TAXI-IDLE                          | 0.060               | 870.0         | 8.470                     | 1011.297              | 1.000              | 7.00                    | 0.988              | 117.98               | 8.376                 | 101.50            | 0.00974            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.782              | 1040.56              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.635              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.731              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.299                     | 1011.297              | 1.000              | 19.00                   | 0.728               | 320.24               | 2.273                 | 275.50            | 0.00264            |
| TAKEOFF                            | 1.000               | 14500.0       | 123.869                   | 8804.355              | 1.000              | 0.70                    | 1.445               | 102.72               | 14.069                | 169.17            | 0.00854            |
| CLIMBOUT                           | 0.850               | 12325.0       | 83.491                    | 7284.480              | 1.000              | 2.20                    | 3.061               | 267.10               | 11.461                | 451.92            | 0.00677            |
| APPROACH                           | 0.400               | 5800.0        | 20.300                    | 3487.744              | 1.000              | 4.00                    | 1.353               | 232.52               | 5.821                 | 386.67            | 0.00350            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.299                     | 1011.297              | 1.000              | 7.00                    | 0.268               | 117.98               | 2.273                 | 101.50            | 0.00264            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 6.856               | 1040.56              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.589               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.951               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 99.665              |                      |                       |                   |                    |

FORM 107-100-000

FORM 107-100-000

DATE: 7/12/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 89 ENGINE TYPE AND MODEL: JT8D-1

SERIAL NUMBER: 653301

RATED THRUST: 14000.

ENGINE TOTAL TIME: 11982. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: 0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 95.00 FINISH 96.00

ATMOSPHERIC PRESSURE: START 14.35 FINISH 14.35

INLET AIR HUMIDITY, LBS H<sub>2</sub>O/LB AIR: 0.0150

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 122.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

H/C IS CAL-ESTIMATED  
 TEMP. SAMPLE LINE AVERAGED  
 A NON-SMOKELESS HOT SECTION  
 INSTALLED DURING THIS SHOP VISIT  
 TOP ARM OF PROBE FAILED DURING LAST RUN  
 WITHOUT RETROFIT

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>UR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 345.00        | 1/ 0         | 790.00                            | 5                        | 2745.00 6935.00                 | 1135.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.04                               | 14.33                                 |
| 400.00        | 1/ 1         | 870.00                            | 6                        | 2814.00 7052.00                 | 1065.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.04                               | 14.33                                 |
| 405.00        | 5/ 1         | 8760.00                           | 62                       | 7200.00 11079.00                | 5290.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.58                               | 14.20                                 |
| 415.00        | 4/ 5         | 10340.00                          | 73                       | 7596.00 11310.00                | 6260.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.72                               | 14.18                                 |
| 420.00        | 3/ 4         | 11330.00                          | 80                       | 7805.00 11510.00                | 6860.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.81                               | 14.17                                 |
| 425.00        | 2/ 3         | 12150.00                          | 86                       | 8005.00 11654.00                | 7440.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.87                               | 14.16                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 5                                 | 730.00                              | 14.90                              | 105.00              | 0.49                          | 45.40                | 6.50                | 3.00                     | 9.50                     | -0.00     | -0.00 | -0.00        |
| 6                                 | 700.00                              | 14.90                              | 109.00              | 0.49                          | 47.50                | 4.90                | 3.00                     | 7.90                     | 3.38      | -0.00 | -0.00        |
| 62                                | 870.00                              | 22.55                              | 25.50               | 1.77                          | 3.50                 | 43.50               | 10.00                    | 53.50                    | 0.25      | -0.00 | -0.00        |
| 73                                | 935.00                              | 24.35                              | 27.20               | 2.07                          | 3.00                 | 32.90               | 15.00                    | 47.90                    | 0.26      | -0.00 | -0.00        |
| 80                                | 970.00                              | 25.65                              | 26.20               | 2.12                          | 2.60                 | 37.80               | 17.00                    | 54.80                    | 0.12      | -0.00 | -0.00        |
| 86                                | 1090.00                             | 26.55                              | 27.20               | 2.22                          | 3.00                 | 41.00               | 27.00                    | 68.00                    | 0.07      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 5                                 | 41.76                              | 10.34                              | 1.96                                | 3061.91                             | 4.25                               | 6.21                                | 47.40                   | 11.74                   | 2.22                     | 3475.26                  | 4.82                    | 7.04                     |
| 6                                 | 43.30                              | 10.81                              | 1.96                                | 3058.21                             | 3.20                               | 5.15                                | 46.11                   | 11.51                   | 2.08                     | 3256.99                  | 3.40                    | 5.49                     |
| 62                                | 2.89                               | 0.23                               | 1.86                                | 3150.73                             | 8.09                               | 9.96                                | 15.28                   | 1.20                    | 9.84                     | 16667.35                 | 42.82                   | 52.67                    |
| 73                                | 2.64                               | 0.17                               | 2.39                                | 3151.29                             | 5.24                               | 7.62                                | 16.50                   | 1.04                    | 14.94                    | 19727.08                 | 32.78                   | 47.72                    |
| 80                                | 2.48                               | 0.14                               | 2.64                                | 3151.61                             | 5.87                               | 8.52                                | 17.01                   | 0.97                    | 18.12                    | 21620.03                 | 40.30                   | 58.42                    |
| 86                                | 2.46                               | 0.16                               | 4.01                                | 3151.60                             | 6.08                               | 10.09                               | 18.28                   | 1.15                    | 29.81                    | 23447.92                 | 45.27                   | 75.08                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 5                                 | 59.995            | 4399.063               | 14.657             | 6.100             | 2.816                  | 8.916                  |
| 6                                 | 53.002            | 3743.672               | 13.228             | 3.914             | 2.396                  | 6.310                  |
| 62                                | 1.745             | 1902.665               | 0.137              | 4.848             | 1.124                  | 6.012                  |
| 73                                | 1.596             | 1907.841               | 0.101              | 3.170             | 1.445                  | 4.615                  |
| 80                                | 1.501             | 1908.211               | 0.085              | 3.557             | 1.600                  | 5.156                  |
| 86                                | 1.505             | 1929.870               | 0.095              | 3.726             | 2.454                  | 6.180                  |

CAL ID NUMBER: 89 ENGINE TYPE AND MODEL: JT8D-1  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 653301

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 42.445                    | 1111.696              | 1.000              | 19.00                   | 13.441             | 352.04               | 38.180                | 266.00            | 0.05053            |
| TAKEOFF                            | 1.000               | 14000.0       | 13.636                    | 8566.836              | 1.000              | 0.70                    | 0.159              | 99.95                | 1.592                 | 163.33            | 0.00097            |
| CLIMBOUT                           | 0.850               | 11900.0       | 14.401                    | 7253.754              | 1.000              | 2.20                    | 0.528              | 265.97               | 1.985                 | 436.33            | 0.00121            |
| APPROACH                           | 0.400               | 5600.0        | 22.901                    | 3601.282              | 1.000              | 4.00                    | 1.527              | 240.09               | 6.359                 | 373.33            | 0.00409            |
| TAXI-IDLE                          | 0.060               | 840.0         | 42.445                    | 1111.696              | 1.000              | 7.00                    | 4.952              | 129.70               | 38.180                | 98.00             | 0.05053            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 20.607             | 1087.74              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.945             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 15.413             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.136              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 11.848                    | 1111.696              | 1.000              | 19.00                   | 3.752              | 352.04               | 10.658                | 266.00            | 0.01411            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.441                     | 8566.836              | 1.000              | 0.70                    | 0.005              | 99.95                | 0.052                 | 163.33            | 0.00003            |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.604                     | 7253.754              | 1.000              | 2.20                    | 0.022              | 265.97               | 0.083                 | 436.33            | 0.00005            |
| APPROACH                           | 0.400               | 5600.0        | 2.085                     | 3601.282              | 1.000              | 4.00                    | 0.139              | 240.09               | 0.579                 | 373.33            | 0.00037            |
| TAXI-IDLE                          | 0.060               | 840.0         | 11.848                    | 1111.696              | 1.000              | 7.00                    | 1.382              | 129.70               | 10.658                | 98.00             | 0.01411            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.301              | 1087.74              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.873              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.965              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.368              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 5.527                     | 1111.696              | 1.000              | 19.00                   | 1.750               | 352.04               | 4.972                 | 266.00            | 0.00658            |
| TAKEOFF                            | 1.000               | 14000.0       | 124.353                   | 8566.836              | 1.000              | 0.70                    | 1.451               | 99.95                | 14.516                | 163.33            | 0.00888            |
| CLIMBOUT                           | 0.850               | 11900.0       | 68.880                    | 7253.754              | 1.000              | 2.20                    | 2.526               | 265.97               | 9.496                 | 436.33            | 0.00579            |
| APPROACH                           | 0.400               | 5600.0        | 24.304                    | 3601.282              | 1.000              | 4.00                    | 1.620               | 240.09               | 6.749                 | 373.33            | 0.00434            |
| TAXI-IDLE                          | 0.060               | 840.0         | 5.527                     | 1111.696              | 1.000              | 7.00                    | 0.645               | 129.70               | 4.972                 | 98.00             | 0.00658            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.992               | 1087.74              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.347               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.977               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 103.627             |                      |                       |                   |                    |

DATE: 7/28/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 344 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 653304

RATED THRUST: 14000.

ENGINE TOTAL TIME: 13257. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 6390. HRS  
N2 COMPRESSOR OVERHAUL: 6390. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPRATURE, DEGREES F: START 81.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 29.31 FINISH 29.31

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0094

RELATIVE HUMIDITY: 61.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 131.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
WITHOUT RETROFIT

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 410.00        | 2/ 0         | 9150.00                           | 65                       | 7190.00                | 10880.00                          | 5460.00                       | -0.00       | -0.000000                                    | 1.60                               | -0.00                                 |
| 415.00        | 1/ 2         | 990.00                            | 7                        | 2120.00                | 7170.00                           | 1075.00                       | -0.00       | -0.000000                                    | 1.04                               | -0.00                                 |
| 420.00        | 3/ 1         | 10800.00                          | 77                       | 7580.00                | 11200.00                          | 6360.00                       | -0.00       | -0.000000                                    | 1.64                               | -0.00                                 |
| 425.00        | 4/ 3         | 11960.00                          | 85                       | 7860.00                | 11400.00                          | 7120.00                       | -0.00       | -0.000000                                    | 1.85                               | -0.00                                 |
| 430.00        | 5/ 4         | 12570.00                          | 89                       | 8010.00                | 11520.00                          | 7610.00                       | -0.00       | -0.000000                                    | 1.92                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 65                                | 875.00                              | 22.71                              | 19.50               | 1.98                          | 2.20                 | 60.80               | 6.00                     | 66.80                    | 0.33      | -0.00 | -0.00        |
| 7                                 | 655.00                              | 14.97                              | 107.00              | 0.65                          | 51.80                | 2.40                | 2.00                     | 4.40                     | 4.10      | -0.00 | -0.00        |
| 77                                | 940.00                              | 24.24                              | 16.00               | 2.26                          | 1.90                 | 85.00               | 8.50                     | 93.50                    | 0.35      | -0.00 | -0.00        |
| 85                                | 970.00                              | 26.36                              | 15.50               | 2.46                          | 1.90                 | 105.40              | 9.50                     | 114.90                   | 0.32      | -0.00 | -0.00        |
| 89                                | 995.00                              | 27.20                              | 15.00               | 2.59                          | 1.90                 | 118.50              | 10.00                    | 128.50                   | 0.41      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 65                                | 1.98                               | 0.13                               | 1.00                                | 3152.44                             | 10.12                              | 11.12                               | 10.79                   | 0.70                    | 5.45                     | 17212.30                 | 55.25                   | 60.71                    |
| 7                                 | 32.78                              | 8.95                               | 0.99                                | 1080.63                             | 1.19                               | 2.18                                | 34.70                   | 9.62                    | 1.07                     | 3311.67                  | 1.28                    | 2.34                     |
| 77                                | 1.42                               | 0.10                               | 1.24                                | 3153.39                             | 12.40                              | 13.64                               | 9.04                    | 0.61                    | 7.89                     | 20055.56                 | 78.85                   | 86.74                    |
| 85                                | 1.26                               | 0.09                               | 1.27                                | 3153.66                             | 14.17                              | 15.40                               | 9.00                    | 0.63                    | 9.06                     | 22454.04                 | 100.57                  | 109.64                   |
| 89                                | 1.16                               | 0.08                               | 1.27                                | 3153.83                             | 15.08                              | 16.36                               | 8.85                    | 0.64                    | 9.69                     | 24000.65                 | 114.80                  | 124.48                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 65                                | 1.179             | 1891.126               | 0.076              | 6.039             | 0.596                  | 6.635                  |
| 7                                 | 35.746            | 3345.124               | 9.717              | 1.291             | 1.076                  | 2.367                  |
| 77                                | 0.837             | 1854.997               | 0.057              | 7.301             | 0.730                  | 8.031                  |
| 85                                | 0.753             | 1877.428               | 0.053              | 8.409             | 0.758                  | 9.167                  |
| 89                                | 0.704             | 1909.360               | 0.051              | 9.137             | 0.771                  | 9.903                  |

CAL ID NUMBER: 344 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 653304  
TEST ORGANIZATION: U.S. BUREAU OF MINES

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 31.312                    | 951.672               | 1.000              | 19.00                   | 9.916              | 301.36               | 32.903                | 266.00            | 0.03728            |
| TAKEOFF                            | 1.000               | 14000.0       | 6.531                     | 8423.043              | 1.000              | 0.70                    | 0.076              | 98.27                | 0.775                 | 163.33            | 0.00047            |
| CLIMBOUT                           | 0.850               | 11900.0       | 7.572                     | 7216.984              | 1.000              | 2.20                    | 0.278              | 264.62               | 1.049                 | 436.33            | 0.00064            |
| APPROACH                           | 0.400               | 5600.0        | 22.534                    | 3874.643              | 1.000              | 4.00                    | 1.502              | 258.31               | 5.816                 | 373.33            | 0.00402            |
| TAXI-IDLE                          | 0.060               | 840.0         | 31.312                    | 951.672               | 1.000              | 7.00                    | 3.653              | 111.03               | 32.903                | 98.00             | 0.03728            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.425             | 1033.59              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 14.924             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.537             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.544              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 8.741                     | 951.672               | 1.000              | 19.00                   | 2.768              | 301.36               | 9.185                 | 266.00            | 0.01041            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.138                     | 8423.043              | 1.000              | 0.70                    | 0.002              | 98.27                | 0.016                 | 163.33            | 0.00001            |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.299                     | 7216.984              | 1.000              | 2.20                    | 0.011              | 264.62               | 0.041                 | 436.33            | 0.00003            |
| APPROACH                           | 0.400               | 5600.0        | 2.229                     | 3874.643              | 1.000              | 4.00                    | 0.149              | 258.31               | 0.575                 | 373.33            | 0.00040            |
| TAXI-IDLE                          | 0.060               | 840.0         | 8.741                     | 951.672               | 1.000              | 7.00                    | 1.020              | 111.03               | 9.185                 | 98.00             | 0.01041            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.949              | 1033.59              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.821              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.954              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.115              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.837                     | 951.672               | 1.000              | 19.00                   | 0.582               | 301.36               | 1.930                 | 266.00            | 0.00219            |
| TAKEOFF                            | 1.000               | 14000.0       | 156.399                   | 8423.043              | 1.000              | 0.70                    | 1.825               | 98.27                | 18.568                | 163.33            | 0.01117            |
| CLIMBOUT                           | 0.850               | 11900.0       | 110.335                   | 7216.984              | 1.000              | 2.20                    | 4.046               | 264.62               | 15.288                | 436.33            | 0.00927            |
| APPROACH                           | 0.400               | 5600.0        | 30.704                    | 3874.643              | 1.000              | 4.00                    | 2.047               | 258.31               | 7.924                 | 373.33            | 0.00548            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.837                     | 951.672               | 1.000              | 7.00                    | 0.214               | 111.03               | 1.930                 | 98.00             | 0.00219            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.713               | 1033.59              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 8.430               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.517               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 130.332             |                      |                       |                   |                    |

DATE: 7/19/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AFRICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 295 ENGINE TYPE AND MODEL: JTRD-1 SERIAL NUMBER: 649131

RATED THRUST: 14000.

ENGINE TOTAL TIME: 14443. HRS

TIME SINCE HOT SECTION OVERHAUL: 3948. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 5712. HRS  
N2 COMPRESSOR OVERHAUL: 5712. HRS  
COMBUSTOR CAN REPLACEMENT: 3948. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3948. HRS  
N1 TURBINE OVERHAUL: 3948. HRS  
N2 TURBINE OVERHAUL: 3948. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 29.35 FINISH 29.35

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0100

RELATIVE HUMIDITY: 51.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 101.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C IS CAL TEMP. AVERAGE  
3-ARM PROBE USED  
WITHOUT RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 215.00     | 4/ 0      | 1000.00                  | 7                  | 2865.00          | 7089.00                  | 990.00                  | -0.000000 | -0.00                               | 1.04                      | -0.00                        |
| 220.00     | 1/ 4      | 10960.00                 | 78                 | 7539.00          | 11248.00                 | 6260.00                 | -0.000000 | -0.00                               | 1.78                      | -0.00                        |
| 225.00     | 2/ 1      | 12050.00                 | 86                 | 7786.00          | 11449.00                 | 6950.00                 | -0.000000 | -0.00                               | 1.86                      | -0.00                        |
| 230.00     | 3/ 2      | 12790.00                 | 91                 | 7970.00          | 11580.00                 | 7410.00                 | -0.000000 | -0.00                               | 1.93                      | -0.00                        |
| 235.00     | 5/ 3      | 9410.00                  | 67                 | 7205.00          | 11040.00                 | 5310.00                 | -0.000000 | -0.00                               | 1.63                      | -0.00                        |
| 235.00     | 4/ 5      | 1030.00                  | 7                  | 2120.00          | 7194.00                  | 980.00                  | -0.000000 | -0.00                               | 1.04                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 7                        | 690.00                     | 14.99                     | 183.00        | 0.71                 | 87.50          | 1.60          | 5.50            | 7.10            | 5.28      | -0.00 | -0.00        |
| 78                       | 940.00                     | 25.10                     | 29.20         | 2.02                 | 3.20           | 58.90         | 15.00           | 73.90           | 0.25      | -0.00 | -0.00        |
| 86                       | 975.00                     | 26.35                     | 26.80         | 2.16                 | 2.60           | 72.70         | 15.00           | 87.70           | 0.24      | -0.00 | -0.00        |
| 91                       | 1005.00                    | 27.35                     | 27.20         | 2.26                 | 2.20           | 81.90         | 24.00           | 105.90          | 0.14      | -0.00 | -0.00        |
| 67                       | 875.00                     | 23.17                     | 32.30         | 1.70                 | 2.20           | 42.90         | 18.00           | 60.90           | 0.17      | -0.00 | -0.00        |
| 7                        | 700.00                     | 14.99                     | 153.00        | 0.60                 | 64.80          | 3.90          | 6.00            | 9.90            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI N1X LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 7                        | 49.87                     | 13.66                     | 2.46                       | 3040.07                    | 0.72                      | 3.18                       | 49.37             | 13.52             | 2.44               | 3009.66            | 0.71              | 3.15               |
| 78                       | 2.90                      | 0.18                      | 2.45                       | 3150.84                    | 9.60                      | 17.05                      | 18.15             | 1.14              | 15.31              | 19724.23           | 60.17             | 75.44              |
| 86                       | 2.49                      | 0.14                      | 2.29                       | 3151.60                    | 11.09                     | 13.38                      | 17.30             | 0.96              | 15.90              | 21903.62           | 77.07             | 92.97              |
| 91                       | 2.41                      | 0.11                      | 3.50                       | 3151.79                    | 11.94                     | 15.44                      | 17.49             | 0.83              | 25.93              | 23354.75           | 88.48             | 114.41             |
| 67                       | 3.81                      | 0.15                      | 3.49                       | 3149.50                    | 8.31                      | 11.79                      | 20.22             | 0.79              | 18.51              | 16723.84           | 44.12             | 62.63              |
| 7                        | 49.42                     | 11.99                     | 3.18                       | 3045.34                    | 2.07                      | 5.25                       | 48.44             | 11.75             | 3.12               | 2984.44            | 2.03              | 5.15               |

| POWER PERCENT RATED T.O. | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 7                        | 49.371         | 3009.665         | 13.520          | 0.707          | 2.437            | 3.146            |
| 78                       | 1.656          | 1799.656         | 0.104           | 5.486          | 1.397            | 6.883            |
| 86                       | 1.435          | 1817.728         | 0.080           | 6.396          | 1.320            | 7.715            |
| 91                       | 1.399          | 1826.016         | 0.065           | 6.918          | 2.027            | 8.945            |
| 67                       | 2.149          | 1777.241         | 0.084           | 4.689          | 1.967            | 6.656            |
| 7                        | 47.025         | 2847.511         | 11.477          | 1.969          | 3.029            | 4.998            |

CAL ID NUMBER: 295 ENGINE TYPE AND MODEL: JT8D-1  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 649131

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 41.611                    | 836.814               | 1.000              | 19.00                   | 13.177             | 264.99               | 49.725                | 266.00            | 0.04954            |
| TAKEOFF                            | 1.000               | 14000.0       | 15.490                    | 8278.098              | 1.000              | 0.70                    | 0.181              | 96.58                | 1.871                 | 163.33            | 0.00111            |
| CLIMBOUT                           | 0.850               | 11900.0       | 18.173                    | 6954.324              | 1.000              | 2.20                    | 0.666              | 254.99               | 2.613                 | 436.33            | 0.00153            |
| APPROACH                           | 0.400               | 5600.0        | 34.553                    | 3309.290              | 1.000              | 4.00                    | 2.304              | 220.62               | 10.441                | 373.33            | 0.00617            |
| TAXI-IDLE                          | 0.060               | 840.0         | 41.611                    | 836.814               | 1.000              | 7.00                    | 4.855              | 97.63                | 49.725                | 98.00             | 0.04954            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 21.182             | 934.81               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 22.659             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 15.843             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.291              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 11.577                    | 836.814               | 1.000              | 19.00                   | 3.666              | 264.99               | 13.835                | 266.00            | 0.01378            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.234                     | 8278.098              | 1.000              | 0.70                    | 0.003              | 96.58                | 0.028                 | 163.33            | 0.00002            |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.381                     | 6954.324              | 1.000              | 2.20                    | 0.014              | 254.99               | 0.055                 | 436.33            | 0.00003            |
| APPROACH                           | 0.400               | 5600.0        | 2.879                     | 3309.290              | 1.000              | 4.00                    | 0.192              | 220.62               | 0.870                 | 373.33            | 0.00051            |
| TAXI-IDLE                          | 0.060               | 840.0         | 11.577                    | 836.814               | 1.000              | 7.00                    | 1.351              | 97.63                | 13.835                | 98.00             | 0.01378            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.225              | 934.81               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.590              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.908              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.195              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.576                     | 836.814               | 1.000              | 19.00                   | 0.816               | 264.99               | 3.079                 | 266.00            | 0.00307            |
| TAKEOFF                            | 1.000               | 14000.0       | 155.731                   | 8278.098              | 1.000              | 0.70                    | 1.817               | 96.58                | 18.812                | 163.33            | 0.01112            |
| CLIMBOUT                           | 0.850               | 11900.0       | 93.248                    | 6954.324              | 1.000              | 2.20                    | 3.419               | 254.99               | 13.409                | 436.33            | 0.00784            |
| APPROACH                           | 0.400               | 5600.0        | 26.997                    | 3309.290              | 1.000              | 4.00                    | 1.800               | 220.62               | 8.158                 | 373.33            | 0.00482            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.576                     | 836.814               | 1.000              | 7.00                    | 0.301               | 97.63                | 3.079                 | 98.00             | 0.00307            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.152               | 934.81               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 8.721               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.097               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 129.776             |                      |                       |                   |                    |

DATE: 6/29/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 122 ENGINE TYPE AND MODEL: JT8D-7

SERIAL NUMBER: 654623

RATED THRUST: 14000.

ENGINE TOTAL TIME: 9748. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11173. HRS  
 N2 COMPRESSOR OVERHAUL: 11574. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANF OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 56.30 FINISH 55.40

ATMOSPHERIC PRESSURE: START 29.95 FINISH 30.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0066

RELATIVE HUMIDITY: 69.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG

| CLOCK TIME | TEST NOOF | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 2355.00    | 1/ 0      | 11050.00           | 78                       | 7380.00          | 10927.00                 | 6291.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 5.00       | 2/ 1      | 12100.00           | 86                       | 7617.00          | 11121.00                 | 6466.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 10.00      | 3/ 2      | 13700.00           | 97                       | 8010.00          | 11387.00                 | 8083.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 235.00     | 4/ 3      | 1100.00            | 7                        | 2960.00          | 11300.00                 | 593.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 78                       | 978.00                     | 52.50                     | 95.00         | 1.70                 | 5.40           | 53.80         | -0.00           | 55.00           | -0.00     | -0.00 | -0.00        |
| 86                       | 914.00                     | 55.10                     | 95.00         | 2.50                 | 4.50           | 120.00        | -0.00           | 121.00          | -0.00     | -0.00 | -0.00        |
| 97                       | 978.80                     | 59.30                     | 95.00         | 2.78                 | 4.20           | 152.50        | -0.00           | 155.00          | -0.00     | -0.00 | -0.00        |
| 7                        | 665.60                     | 31.80                     | 133.00        | 0.47                 | 16.50          | 1.25          | -0.00           | 4.50            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CU LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 78                       | 11.16                     | 0.36                      | -0.00                      | 3137.36                    | 10.38                     | 10.61                      | 70.20             | 2.24              | -0.00              | 19737.14           | 65.30             | 66.75              |
| 86                       | 7.60                      | 0.21                      | -0.00                      | 3143.38                    | 15.77                     | 15.90                      | 52.96             | 1.44              | -0.00              | 21896.78           | 109.88            | 110.79             |
| 97                       | 6.84                      | 0.17                      | -0.00                      | 3144.67                    | 18.03                     | 18.33                      | 55.28             | 1.40              | -0.00              | 25418.35           | 145.77            | 148.15             |
| 7                        | 55.09                     | 3.91                      | -0.00                      | 1058.60                    | 0.85                      | 3.06                       | 32.67             | 2.32              | -0.00              | 1813.75            | 0.50              | 1.82               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 78                       | 4.353          | 1796.166         | 0.207           | 5.909          | -0.000           | 6.041            |
| 86                       | 4.377          | 1809.651         | 0.119           | 9.081          | -0.000           | 9.156            |
| 97                       | 4.035          | 1955.354         | 0.102           | 10.640         | -0.000           | 10.814           |
| 7                        | 29.696         | 1648.864         | 2.110           | 0.458          | -0.000           | 1.650            |

CAL ID NUMBER: 122 ENGINE TYPE AND MODEL: JT8D-7  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 654623

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 28.028                    | 473.920               | 1.000              | 19.00                   | 8.876              | 150.07               | 59.142                | 266.00            | 0.03337            |
| TAKEOFF                            | 1.000               | 14000.0       | 51.908                    | 8137.016              | 1.000              | 0.70                    | 0.606              | 94.93                | 6.379                 | 163.33            | 0.00371            |
| CLIMBOUT                           | 0.850               | 11900.0       | 50.516                    | 6853.508              | 1.000              | 2.20                    | 1.852              | 251.30               | 7.371                 | 436.33            | 0.00425            |
| APPROACH                           | 0.400               | 5600.0        | 49.644                    | 3308.871              | 1.000              | 4.00                    | 3.310              | 220.59               | 15.003                | 373.33            | 0.00886            |
| TAXI-IDLE                          | 0.060               | 840.0         | 28.028                    | 473.920               | 1.000              | 7.00                    | 3.270              | 55.29                | 59.142                | 98.00             | 0.03337            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 17.913             | 772.18               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 23.198             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.398             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 4.326              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.264                     | 473.920               | 1.000              | 19.00                   | 0.717              | 150.07               | 4.778                 | 266.00            | 0.00270            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.888                     | 8137.016              | 1.000              | 0.70                    | 0.010              | 94.93                | 0.109                 | 163.33            | 0.00006            |
| CLIMBOUT                           | 0.850               | 11900.0       | 1.288                     | 6853.508              | 1.000              | 2.20                    | 0.047              | 251.30               | 0.188                 | 436.33            | 0.00011            |
| APPROACH                           | 0.400               | 5600.0        | 1.594                     | 3308.871              | 1.000              | 4.00                    | 0.106              | 220.59               | 0.482                 | 373.33            | 0.00028            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.264                     | 473.920               | 1.000              | 7.00                    | 0.264              | 55.29                | 4.778                 | 98.00             | 0.00270            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 1.145              | 772.18               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 1.483              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 0.856              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.740              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.164                     | 473.920               | 1.000              | 19.00                   | 0.369               | 150.07               | 2.457                 | 266.00            | 0.00139            |
| TAKEOFF                            | 1.000               | 14000.0       | 153.156                   | 8137.016              | 1.000              | 0.70                    | 1.787               | 94.93                | 18.822                | 163.33            | 0.01094            |
| CLIMBOUT                           | 0.850               | 11900.0       | 107.178                   | 6853.508              | 1.000              | 2.20                    | 3.930               | 251.30               | 15.638                | 436.33            | 0.00901            |
| APPROACH                           | 0.400               | 5600.0        | 28.418                    | 3308.871              | 1.000              | 4.00                    | 1.895               | 220.59               | 8.589                 | 373.33            | 0.00507            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.164                     | 473.920               | 1.000              | 7.00                    | 0.136               | 55.29                | 2.457                 | 98.00             | 0.00139            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.116               | 772.18               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.510              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.070               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 127.630             |                      |                       |                   |                    |

DATE: 7/ 2/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 127 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 656065

RATED THRUST: 14000.

ENGINE TOTAL TIME: 3779. HRS

TIME SINCE HOT SECTION OVERHAUL: 3355. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9077. HRS  
 N2 COMPRESSOR OVERHAUL: 2832. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 3355. HRS  
 N1 TURBINE OVERHAUL: 3229. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 54.86 FINISH 54.14

ATMOSPHERIC PRESSURE: START 29.91 FINISH 29.97

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0060

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-----------------|----------|-------------------------------------|---------------------------|------------------------------|
| 28.00      | 1/ 0      | 10974.00           | 78                       | 7356.00          | 10875.00                 | 6293.00         | -0.00    | -0.000000                           | -0.00                     | 1.75                         |
| 32.00      | 2/ 1      | 12178.00           | 86                       | 7633.00          | 11076.00                 | 7059.00         | -0.00    | -0.000000                           | -0.00                     | 1.85                         |
| 36.00      | 3/ 2      | 13439.00           | 95                       | 7940.00          | 11289.00                 | 7934.00         | -0.00    | -0.000000                           | -0.00                     | 1.96                         |
| 150.00     | 4/ 3      | 935.00             | 6                        | 2831.00          | 6439.00                  | 1073.00         | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 78                       | 887.00                     | 52.20                     | 25.00         | 2.14                 | 1.20           | 8.60          | -0.00           | 91.00           | -0.00     | -0.00 | -0.00        |
| 86                       | 924.80                     | 55.30                     | 20.00         | 2.25                 | 0.75           | 103.00        | -0.00           | 108.00          | -0.00     | -0.00 | -0.00        |
| 95                       | 944.00                     | 58.50                     | 20.00         | 2.45                 | 0.30           | 125.00        | -0.00           | 131.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 649.40                     | 31.40                     | 90.00         | 0.48                 | 42.00          | 4.00          | -0.00           | 4.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 78                       | 2.34                      | 0.06                      | -0.00                      | 3152.03                    | 1.32                      | 14.01                      | 14.75             | 0.41              | -0.00              | 19835.73           | 8.33              | 88.18              |
| 86                       | 1.78                      | 0.04                      | -0.00                      | 3152.98                    | 15.09                     | 15.82                      | 12.59             | 0.27              | -0.00              | 22256.89           | 106.51            | 111.68             |
| 95                       | 1.64                      | 0.01                      | -0.00                      | 3153.28                    | 16.82                     | 17.63                      | 13.00             | 0.11              | -0.00              | 25018.09           | 133.44            | 139.84             |
| 6                        | 36.65                     | 9.80                      | -0.00                      | 3071.42                    | 2.68                      | 2.68                       | 39.33             | 10.51             | -0.00              | 3295.64            | 2.87              | 2.87               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 78                       | 1.344          | 1807.520         | 0.037           | 0.759          | -0.000           | 8.035            |
| 86                       | 1.034          | 1827.631         | 0.022           | 8.746          | -0.000           | 9.171            |
| 95                       | 0.967          | 1861.604         | 0.008           | 9.429          | -0.000           | 10.406           |
| 6                        | 42.062         | 1524.744         | 11.242          | 3.071          | -0.000           | 3.071            |

CAL ID NUMBER: 127 ENGINE TYPE AND MODEL: JT8D-7  
TEST ORGANIZATION: UNITED/EPA

SERIAL NUMBER: 656065

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 36.131                    | 972.871               | 1.000              | 19.00                   | 11.441             | 308.08               | 37.138                | 266.00            | 0.04301            |
| TAKEOFF                            | 1.000               | 14000.0       | 9.301                     | 8285.004              | 1.000              | 0.70                    | 0.109              | 96.66                | 1.123                 | 163.33            | 0.00066            |
| CLIMBOUT                           | 0.850               | 11900.0       | 11.730                    | 6939.211              | 1.000              | 2.20                    | 0.430              | 254.44               | 1.690                 | 436.33            | 0.00099            |
| APPROACH                           | 0.400               | 5600.0        | 26.452                    | 3372.059              | 1.000              | 4.00                    | 1.763              | 224.80               | 7.845                 | 373.33            | 0.00472            |
| TAXI-IDLE                          | 0.060               | 840.0         | 36.131                    | 972.871               | 1.000              | 7.00                    | 4.215              | 113.50               | 37.138                | 98.00             | 0.04301            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 17.959             | 997.48               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.004             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.432             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.775              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 8.820                     | 972.871               | 1.000              | 19.00                   | 2.793              | 308.08               | 9.066                 | 266.00            | 0.01050            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8285.004              | 1.000              | 0.70                    | 0.0                | 96.66                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.219                     | 6939.211              | 1.000              | 2.20                    | 0.008              | 254.44               | 0.032                 | 436.33            | 0.00002            |
| APPROACH                           | 0.400               | 5600.0        | 1.667                     | 3372.059              | 1.000              | 4.00                    | 0.111              | 224.80               | 0.494                 | 373.33            | 0.00030            |
| TAXI-IDLE                          | 0.060               | 840.0         | 8.820                     | 972.871               | 1.000              | 7.00                    | 1.029              | 113.50               | 9.066                 | 98.00             | 0.01050            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.941              | 997.48               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.951              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.948              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.406                     | 972.871               | 1.000              | 19.00                   | 0.762               | 308.08               | 2.473                 | 266.00            | 0.00286            |
| TAKEOFF                            | 1.000               | 14000.0       | 154.669                   | 8285.004              | 1.000              | 0.70                    | 1.804               | 96.66                | 18.669                | 163.33            | 0.01105            |
| CLIMBOUT                           | 0.850               | 11900.0       | 106.596                   | 6939.211              | 1.000              | 2.20                    | 3.909               | 254.44               | 15.361                | 436.33            | 0.00896            |
| APPROACH                           | 0.400               | 5600.0        | 28.600                    | 3372.059              | 1.000              | 4.00                    | 1.907               | 224.80               | 8.481                 | 373.33            | 0.00511            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.406                     | 972.871               | 1.000              | 7.00                    | 0.281               | 113.50               | 2.473                 | 98.00             | 0.00286            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.662               | 997.48               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 8.684               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.479               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 128.891             |                      |                       |                   |                    |

DATE: 7/28/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 345 ENGINE TYPE AND MODEL: JT8D-7

SERIAL NUMBER: 654462

RATED THRUST: 14000.

ENGINE TOTAL TIME: 9898. HRS

TIME SINCE HOT SECTION OVERHAUL: 4917. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9898. HRS  
 N2 COMPRESSOR OVERHAUL: 9898. HRS  
 COMBUSTOR CAN REPLACEMENT: 3718. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 4917. HRS  
 N1 TURBINE OVERHAUL: 9898. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4

FUEL H/C RATIO: 0.0

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 73.00 FINISH 73.00

ATMOSPHERIC PRESSURE: START 29.29 FINISH 29.29

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0144

RELATIVE HUMIDITY: 79.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 136.0C; FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C CAL ESTIMATED  
 SAMPLE LINE TEMP. AVERAGE  
 ENGINE DID NOT LIFE OFF ON FIRST TWO ATTEMPTS  
 THUS A LARGE AMOUNT OF RAW FUELSOAKED PROBE BEFORE FIRST IDLE MODE  
 PROBE LOCATED 10" FROM TAILPIPE  
 FIRST IDLE MODE UNTRIMMED  
 WITHOUT RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OP SHP | PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 940.00     | 1/ 0      | 740.00                   | 5                  | 2580.00                | 6650.00                  | 960.00                  | -0.00    | 0.0                                 | -0.00                     | 1.04                         |
| 955.00     | 5/ 1      | 9750.00                  | 69                 | 7275.00                | 11060.00                 | 5740.00                 | -0.00    | 0.0                                 | -0.00                     | 1.67                         |
| 1010.00    | 1/ 5      | 1000.00                  | 7                  | 2900.00                | 7150.00                  | 1110.00                 | -0.00    | 0.0                                 | -0.00                     | 1.04                         |
| 1015.00    | 4/ 1      | 10940.00                 | 78                 | 7530.00                | 11250.00                 | 6520.00                 | -0.00    | 0.0                                 | -0.00                     | 1.76                         |
| 1020.00    | 3/ 4      | 12060.00                 | 86                 | 7780.00                | 11480.00                 | 7230.00                 | -0.00    | 0.0                                 | -0.00                     | 1.86                         |
| 1030.00    | 2/ 3      | 12960.00                 | 92                 | 7990.00                | 11620.00                 | 7860.00                 | -0.00    | 0.0                                 | -0.00                     | 1.94                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 730.00                     | 14.81                     | 154.70        | 0.51                 | 127.40         | 2.90          | 2.00            | 4.90            | -0.00     | -0.00 | -0.00        |
| 69                       | 910.00                     | 23.49                     | 29.00         | 2.02                 | 1.70           | 47.20         | 24.00           | 71.20           | 0.34      | -0.00 | -0.00        |
| 7                        | 710.00                     | 14.81                     | 131.00        | 0.53                 | 67.00          | 3.90          | 7.00            | 10.90           | 4.25      | -0.00 | -0.00        |
| 78                       | 960.00                     | 24.92                     | 11.20         | 2.31                 | 1.50           | 56.20         | 40.00           | 96.20           | 0.41      | -0.00 | -0.00        |
| 86                       | 1000.00                    | 26.77                     | 34.20         | 2.54                 | 1.50           | 67.10         | 51.00           | 118.10          | 0.56      | -0.00 | -0.00        |
| 92                       | 1035.00                    | 27.37                     | 36.20         | 2.72                 | 1.50           | 78.50         | 60.00           | 138.50          | 0.61      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 66.32                     | 31.63                     | 1.42                       | 3473.47                    | 2.06                      | 3.49                       | 63.67             | 30.36             | 1.37               | 3334.53            | 1.98              | 3.35               |
| 69                       | 3.34                      | 0.11                      | 4.54                       | 3658.89                    | 8.94                      | 13.48                      | 19.19             | 0.64              | 26.09              | 21002.00           | 51.30             | 77.39              |
| 7                        | 55.57                     | 16.28                     | 4.88                       | 3532.48                    | 2.72                      | 7.59                       | 61.68             | 18.07             | 5.41               | 3921.05            | 3.02              | 8.43               |
| 78                       | 3.35                      | 0.09                      | 6.62                       | 3658.95                    | 9.31                      | 15.93                      | 21.82             | 0.56              | 43.19              | 23856.34           | 60.68             | 103.86             |
| 86                       | 3.14                      | 0.08                      | 7.68                       | 3659.30                    | 10.11                     | 17.79                      | 22.67             | 0.57              | 55.53              | 26456.75           | 73.06             | 128.60             |
| 92                       | 3.10                      | 0.07                      | 8.44                       | 3659.38                    | 11.04                     | 19.48                      | 24.36             | 0.58              | 66.33              | 28762.69           | 86.78             | 153.11             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 86.437         | 4506.125         | 41.031          | 2.679          | 1.847            | 4.526            |
| 69                       | 1.468          | 2154.052         | 0.066           | 5.262          | 2.675            | 7.937            |
| 7                        | 61.682         | 3921.048         | 18.068          | 3.016          | 5.414            | 8.430            |
| 78                       | 1.995          | 2180.653         | 0.052           | 5.546          | 3.947            | 9.494            |
| 86                       | 1.880          | 2193.760         | 0.047           | 6.058          | 4.605            | 10.663           |
| 92                       | 1.880          | 2219.343         | 0.045           | 6.696          | 5.118            | 11.814           |

CAL ID NUMBER: 345 ENGINE TYPE AND MODEL: J78D-7  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 654462

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 63.311                    | 1072.087              | 1.000              | 19.00                   | 20.048             | 339.49               | 59.054                | 266.00            | 0.07537            |
| TAKEOFF                            | 1.000               | 14000.0       | 24.687                    | 8639.383              | 1.000              | 0.70                    | 0.288              | 100.79               | 2.858                 | 163.33            | 0.00176            |
| CLIMBOUT                           | 0.850               | 11900.0       | 21.938                    | 7313.523              | 1.000              | 2.20                    | 0.804              | 268.16               | 3.000                 | 436.33            | 0.00184            |
| APPROACH                           | 0.400               | 5600.0        | 40.093                    | 3367.071              | 1.000              | 4.00                    | 2.673              | 224.47               | 11.907                | 373.33            | 0.00716            |
| TAXI-IDLE                          | 0.060               | 840.0         | 63.311                    | 1072.087              | 1.000              | 7.00                    | 7.386              | 125.08               | 59.054                | 98.00             | 0.07537            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 31.200             | 1058.00              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 29.490             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 23.336             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 2.057              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 23.697                    | 1072.087              | 1.000              | 19.00                   | 7.504              | 339.49               | 22.104                | 266.00            | 0.02821            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8639.383              | 1.000              | 0.70                    | 0.0                | 100.79               | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.0                       | 7313.523              | 1.000              | 2.20                    | 0.0                | 268.16               | 0.0                   | 436.33            | 0.0                |
| APPROACH                           | 0.400               | 5600.0        | 6.350                     | 3367.071              | 1.000              | 4.00                    | 0.423              | 224.47               | 1.886                 | 373.33            | 0.00113            |
| TAXI-IDLE                          | 0.060               | 840.0         | 23.697                    | 1072.087              | 1.000              | 7.00                    | 2.765              | 125.08               | 22.104                | 98.00             | 0.02821            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.692             | 1058.00              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.106             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.997              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 4.032                     | 1072.087              | 1.000              | 19.00                   | 1.277               | 339.49               | 3.761                 | 266.00            | 0.00480            |
| TAKEOFF                            | 1.000               | 14000.0       | 188.663                   | 8639.383              | 1.000              | 0.70                    | 2.201               | 100.79               | 21.838                | 163.33            | 0.01348            |
| CLIMBOUT                           | 0.850               | 11900.0       | 128.360                   | 7313.523              | 1.000              | 2.20                    | 4.707               | 268.16               | 17.551                | 436.33            | 0.01079            |
| APPROACH                           | 0.400               | 5600.0        | 32.695                    | 3367.071              | 1.000              | 4.00                    | 2.180               | 224.47               | 9.710                 | 373.33            | 0.00584            |
| TAXI-IDLE                          | 0.060               | 840.0         | 4.032                     | 1072.087              | 1.000              | 7.00                    | 0.470               | 125.08               | 3.761                 | 98.00             | 0.00480            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.834              | 1058.00              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.241              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.104               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 157.219             |                      |                       |                   |                    |

DATE: 7/29/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 346 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 654992

RATED THRUST: 14000.

ENGINE TOTAL TIME: 5804. HRS

TIME SINCE HOT SECTION OVERHAUL: 2161. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 5804. HRS  
N2 COMPRESSOR OVERHAUL: 5804. HRS  
COMBUSTOR CAN REPLACEMENT: 2161. HRS  
FIRST STAGE NOZZLE GUIDE VANES OVERHAUL: 2161. HRS  
N1 TURBINE OVERHAUL: 5804. HRS  
N2 TURBINE OVERHAUL: 580. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 67.00 FINISH 68.00

ATMOSPHERIC PRESSURE: START 29.30 FINISH 29.30

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0110

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 137.00 FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
PROBE LOCATED 10" FROM TAILPIPE  
WITHOUT RETROFIT

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2      | MEASURED FUEL FLOW LB/HP | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE PATIG EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|----------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 820.00     | 4/ 0      | 10780.00           | 76                       | 7490.00          | 11130.00 | 6280.00 | -0.00                    | -0.000000               | -0.00    | 1.75                                | -0.00                     |                              |
| 875.00     | 3/ 4      | 12060.00           | 86                       | 7900.00          | 11360.00 | 7110.00 | -0.00                    | -0.000000               | -0.00    | 1.87                                | -0.00                     |                              |
| 835.00     | 2/ 3      | 13150.00           | 93                       | 8070.00          | 11540.00 | 7910.00 | -0.00                    | -0.000000               | -0.00    | 1.97                                | -0.00                     |                              |
| 845.00     | 1/ 2      | 1050.00            | 7                        | 2950.00          | 7240.00  | 1040.00 | -0.00                    | -0.000000               | -0.00    | 1.04                                | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 76                       | 865.00                     | 24.01                     | 20.20         | 2.02                 | 10.80          | 58.00         | 6.50            | 64.50           | -0.00     | -0.00 | -0.00        |
| 86                       | 910.00                     | 26.54                     | 16.00         | 2.19                 | 6.50           | 72.90         | 8.00            | 80.90           | -0.00     | -0.00 | -0.00        |
| 93                       | 950.00                     | 27.93                     | 14.00         | 2.44                 | 3.90           | 90.60         | 9.00            | 99.60           | -0.00     | -0.00 | -0.00        |
| 7                        | 620.00                     | 14.98                     | 107.00        | 0.51                 | 49.70          | 0.70          | 5.00            | 5.70            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|
| 76                       | 2.01                      | 0.61                      | 1.06                       | 3151.05                    | 9.46                      | 10.52                      | 12.54                     | 3.86                      | 6.66                       | 19798.61                   | 59.40                     | 66.06                      |
| 86                       | 1.47                      | 0.34                      | 1.20                       | 3152.65                    | 10.97                     | 12.17                      | 10.42                     | 2.43                      | 8.56                       | 22415.35                   | 79.00                     | 86.56                      |
| 93                       | 1.15                      | 0.18                      | 1.22                       | 3153.58                    | 12.24                     | 13.46                      | 9.11                      | 1.45                      | 9.62                       | 24244.78                   | 96.83                     | 106.45                     |
| 7                        | 40.88                     | 10.88                     | 3.14                       | 3061.81                    | 0.44                      | 3.58                       | 42.57                     | 11.31                     | 3.26                       | 3184.28                    | 0.46                      | 3.72                       |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 76                       | 1.168          | 1835.678         | 0.358           | 5.510          | 0.618            | 6.128            |
| 86                       | 0.864          | 1858.653         | 0.201           | 6.468          | 0.710            | 7.178            |
| 93                       | 0.693          | 1896.941         | 0.111           | 7.363          | 0.731            | 8.095            |
| 7                        | 40.495         | 3032.653         | 10.772          | 0.475          | 3.108            | 3.543            |

CAL ID NUMBER: 346 ENGINE TYPE AND MODEL: JT8D-7  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 654992

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 34.100                    | 822.701               | 1.000              | 19.00                   | 10.798             | 260.52               | 41.448                | 266.00            | 0.04059            |
| TAKEOFF                            | 1.000               | 14000.0       | 8.258                     | 8522.590              | 1.000              | 0.70                    | 0.096              | 99.43                | 0.969                 | 163.33            | 0.00059            |
| CLIMBOUT                           | 0.850               | 11900.0       | 11.486                    | 7158.480              | 1.000              | 2.20                    | 0.421              | 262.48               | 1.605                 | 436.33            | 0.00097            |
| APPROACH                           | 0.400               | 5600.0        | 30.095                    | 3379.055              | 1.000              | 4.00                    | 2.006              | 225.27               | 8.906                 | 373.33            | 0.00537            |
| TAXI-IDLE                          | 0.060               | 840.0         | 34.100                    | 822.701               | 1.000              | 7.00                    | 3.978              | 95.98                | 41.448                | 98.00             | 0.04059            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 17.300             | 943.68               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.333             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 12.940             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.688              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 10.388                    | 822.701               | 1.000              | 19.00                   | 3.290              | 260.52               | 12.627                | 266.00            | 0.01237            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.508                     | 8522.590              | 1.000              | 0.70                    | 0.006              | 99.43                | 0.060                 | 163.33            | 0.00004            |
| CLIMBOUT                           | 0.850               | 11900.0       | 3.000                     | 7158.480              | 1.000              | 2.20                    | 0.110              | 262.48               | 0.419                 | 436.33            | 0.00025            |
| APPROACH                           | 0.400               | 5600.0        | 6.594                     | 3379.055              | 1.000              | 4.00                    | 0.440              | 225.27               | 1.952                 | 373.33            | 0.00118            |
| TAXI-IDLE                          | 0.060               | 840.0         | 10.388                    | 822.701               | 1.000              | 7.00                    | 1.212              | 95.98                | 12.627                | 98.00             | 0.01237            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.057              | 943.68               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.359              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.782              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.423              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.816                     | 822.701               | 1.000              | 19.00                   | 0.892               | 260.52               | 3.423                 | 266.00            | 0.00335            |
| TAKEOFF                            | 1.000               | 14000.0       | 125.935                   | 8522.590              | 1.000              | 0.70                    | 1.469               | 99.43                | 14.777                | 163.33            | 0.00900            |
| CLIMBOUT                           | 0.850               | 11900.0       | 86.415                    | 7158.480              | 1.000              | 2.20                    | 3.169               | 262.48               | 12.072                | 436.33            | 0.00726            |
| APPROACH                           | 0.400               | 5600.0        | 24.617                    | 3379.055              | 1.000              | 4.00                    | 1.641               | 225.27               | 7.285                 | 373.33            | 0.00440            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.816                     | 822.701               | 1.000              | 7.00                    | 0.329               | 95.98                | 3.423                 | 98.00             | 0.00335            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.499               | 943.68               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.947               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.609               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 104.946             |                      |                       |                   |                    |

DATE: 6/23/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINEF DATA \*\*\*\*\*

CAL ID NUMBER: 63 ENGINE TYPE AND MODEL: JT8D

SERIAL NUMBER: X-370-47A

RATED THRUST: 15500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C

FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 70.99 FINISH 78.25

ATMOSPHERIC PRESSURE: START 29.88 FINISH 29.86

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.1400

RELATIVE HUMIDITY: 81.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

BURNER = 409-H

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1010.00    | 1/ 0      | 792.00             | 5                        | 2625.00          | 6515.00                  | 950.00                  | 0.008700 | 248.00                              | 1.04                      | 1001.00                      |
| 1023.00    | 2/ 1      | 1857.00            | 11                       | 3810.00          | 8160.00                  | 1519.00                 | 0.009710 | 359.50                              | 1.10                      | 1128.00                      |
| 1032.00    | 3/ 2      | 6015.00            | 38                       | 6040.00          | 9935.00                  | 3452.50                 | 0.010970 | 578.20                              | 1.35                      | 1340.00                      |
| 1043.00    | 4/ 3      | 9982.00            | 64                       | 7145.00          | 10770.00                 | 5644.00                 | 0.013410 | 696.50                              | 1.64                      | 1405.00                      |
| 1102.00    | 5/ 4      | 13033.00           | 84                       | 7800.00          | 11180.00                 | 7563.00                 | 0.015200 | 772.30                              | 1.90                      | 1770.00                      |
| 1111.00    | 6/ 5      | 15581.00           | 100                      | 8435.00          | 11590.00                 | 9374.50                 | 0.016810 | 843.80                              | 2.12                      | 1927.00                      |
| 1120.00    | 7/ 6      | 12055.00           | 77                       | 7580.00          | 11055.00                 | 6825.50                 | 0.014690 | 749.30                              | 1.80                      | 1720.00                      |
| 1130.00    | 8/ 7      | 6973.00            | 44                       | 6365.00          | 10185.00                 | 3981.50                 | 0.010710 | 615.80                              | 1.42                      | 1360.00                      |
| 1138.00    | 9/ 8      | 4981.00            | 32                       | 5620.00          | 9655.00                  | 2927.00                 | 0.010510 | 539.20                              | 1.28                      | 1275.00                      |
| 1150.00    | 10/ 9     | 1283.00            | 8                        | 3175.00          | 7400.00                  | 1155.00                 | 0.009140 | 309.70                              | 1.06                      | 1038.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO <sub>2</sub> (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO <sub>2</sub> (WET) PPMV | NO <sub>x</sub> (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------------------|----------------|---------------|----------------------------|----------------------------|-----------|-------|--------------|
| 5                        | 780.00                     | 15.20                     | 229.20        | 1.09                            | 84.80          | 9.20          | 3.40                       | 12.60                      | -0.00     | -0.00 | -0.00        |
| 11                       | 774.40                     | 15.98                     | 114.50        | 1.30                            | 23.60          | 15.40         | 5.00                       | 20.40                      | -0.00     | -0.00 | -0.00        |
| 38                       | 763.10                     | 19.59                     | 42.60         | 1.60                            | 6.20           | 39.30         | 5.50                       | 44.80                      | -0.00     | -0.00 | -0.00        |
| 64                       | 890.60                     | 23.73                     | 18.30         | 2.06                            | 7.10           | 86.90         | 5.80                       | 92.70                      | -0.00     | -0.00 | -0.00        |
| 84                       | 989.40                     | 27.43                     | 43.90         | 2.31                            | 4.40           | 139.70        | 8.30                       | 148.00                     | -0.00     | -0.00 | -0.00        |
| 100                      | 1086.00                    | 30.55                     | 35.80         | 2.64                            | 4.20           | 209.30        | 10.50                      | 219.80                     | -0.00     | -0.00 | -0.00        |
| 77                       | 965.10                     | 25.97                     | 49.30         | 2.14                            | 4.50           | 119.20        | 8.30                       | 177.50                     | -0.00     | -0.00 | -0.00        |
| 44                       | 803.80                     | 20.56                     | 59.60         | 1.53                            | 6.50           | 49.10         | 7.50                       | 56.60                      | -0.00     | -0.00 | -0.00        |
| 32                       | 735.00                     | 16.66                     | 116.70        | 1.29                            | 9.50           | 29.80         | 8.20                       | 38.00                      | -0.00     | -0.00 | -0.00        |
| 8                        | 764.40                     | 15.49                     | 142.20        | 0.95                            | 35.10          | 10.20         | 7.10                       | 17.30                      | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FLOW CO LB/1K LB FUEL | MASS FLOW HC LB/1K LB FUEL | MASS FLOW NO <sub>2</sub> LB/1K LB FUEL | MASS FLOW CO <sub>2</sub> LB/1K LB FUEL | MASS FLOW NO LB/1K LB FUEL | MASS FLOW NO <sub>2</sub> LB/1K LB FUEL | MASS FLOW CO LB/HR | MASS FLOW HC LB/HR | MASS FLOW NO <sub>2</sub> LB/HR | MASS FLOW CO <sub>2</sub> LB/HR | MASS FLOW NO LB/HR | MASS FLOW NO <sub>x</sub> LB/HR |
|--------------------------|----------------------------|----------------------------|-----------------------------------------|-----------------------------------------|----------------------------|-----------------------------------------|--------------------|--------------------|---------------------------------|---------------------------------|--------------------|---------------------------------|
| 5                        | 40.82                      | 8.65                       | 0.99                                    | 3049.89                                 | 2.69                       | 3.69                                    | 18.78              | 8.22               | 0.94                            | 2497.39                         | 2.56               | 3.50                            |
| 11                       | 17.40                      | 2.05                       | 1.25                                    | 3104.77                                 | 3.84                       | 5.09                                    | 26.44              | 3.12               | 1.90                            | 4716.13                         | 5.84               | 7.74                            |
| 38                       | 5.30                       | 0.44                       | 1.12                                    | 3128.21                                 | 8.03                       | 9.16                                    | 18.30              | 1.53               | 3.88                            | 10800.13                        | 27.73              | 31.61                           |
| 64                       | 1.77                       | 0.19                       | 0.92                                    | 3133.88                                 | 13.82                      | 14.74                                   | 10.00              | 2.22               | 5.21                            | 17687.61                        | 74.00              | 83.21                           |
| 84                       | 3.79                       | 0.22                       | 1.18                                    | 3131.20                                 | 19.80                      | 20.97                                   | 28.64              | 1.64               | 8.90                            | 23681.24                        | 149.72             | 158.61                          |
| 100                      | 2.70                       | 0.18                       | 1.30                                    | 3133.00                                 | 25.97                      | 27.27                                   | 25.35              | 1.70               | 12.21                           | 29370.79                        | 243.42             | 255.63                          |
| 77                       | 4.59                       | 0.24                       | 1.27                                    | 3129.88                                 | 18.23                      | 19.49                                   | 31.37              | 1.64               | 8.66                            | 21362.96                        | 124.40             | 133.06                          |
| 44                       | 7.75                       | 0.48                       | 1.60                                    | 3124.25                                 | 10.48                      | 12.08                                   | 30.84              | 1.93               | 6.37                            | 17439.20                        | 41.73              | 48.11                           |
| 32                       | 17.89                      | 0.83                       | 2.06                                    | 3107.35                                 | 7.50                       | 9.57                                    | 52.37              | 2.44               | 4.04                            | 9095.20                         | 21.96              | 28.01                           |
| 8                        | 29.34                      | 4.15                       | 2.41                                    | 3080.26                                 | 3.46                       | 5.86                                    | 33.89              | 4.79               | 2.78                            | 3557.70                         | 3.99               | 6.77                            |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO <sub>2</sub> LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO <sub>2</sub> LB/1K#TH-HR | NO <sub>x</sub> LB/1K#TH-HR |
|--------------------------|----------------|-----------------------------|-----------------|----------------|-----------------------------|-----------------------------|
| 5                        | 48.959         | 3658.325                    | 10.374          | 3.228          | 1.193                       | 4.421                       |
| 11                       | 14.236         | 2539.652                    | 1.681           | 3.145          | 1.021                       | 4.166                       |
| 38                       | 3.043          | 1795.532                    | 0.254           | 4.610          | 0.645                       | 5.256                       |
| 64                       | 1.002          | 1771.951                    | 0.223           | 7.814          | 0.522                       | 8.336                       |
| 84                       | 2.198          | 1917.021                    | 0.126           | 11.488         | 0.683                       | 12.170                      |
| 100                      | 1.627          | 1885.007                    | 0.109           | 15.623         | 0.784                       | 16.407                      |
| 77                       | 2.598          | 1772.125                    | 0.136           | 10.319         | 0.719                       | 11.038                      |
| 44                       | 4.423          | 1783.909                    | 0.276           | 5.985          | 0.914                       | 6.899                       |
| 32                       | 10.513         | 1825.979                    | 0.490           | 4.410          | 1.213                       | 5.623                       |
| 8                        | 26.417         | 2772.953                    | 3.735           | 3.112          | 2.167                       | 5.279                       |

CAL TO NUMBER: 63 ENGINE TYPE AND MODEL: JT8D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-370-47A

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 38.597                    | 966.115               | 1.000              | 19.00                   | 12.222             | 305.94               | 39.951                | 294.50            | 0.04150            |
| TAKEOFF                            | 1.000               | 15500.0       | 20.127                    | 9485.969              | 1.000              | 0.70                    | 0.235              | 110.67               | 2.122                 | 180.83            | 0.00130            |
| CLIMBOUT                           | 0.850               | 13175.0       | 20.335                    | 7814.688              | 1.000              | 2.20                    | 0.746              | 286.54               | 2.602                 | 483.08            | 0.00154            |
| APPROACH                           | 0.400               | 6200.0        | 32.719                    | 3672.174              | 1.000              | 4.00                    | 2.181              | 244.81               | 8.910                 | 413.33            | 0.00528            |
| TAXI-IDLE                          | 0.060               | 930.0         | 38.597                    | 966.115               | 1.000              | 7.00                    | 4.503              | 112.71               | 39.951                | 108.50            | 0.04150            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 19.887             | 1060.67              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.750             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.435             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.515              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 6.769                     | 966.115               | 1.000              | 19.00                   | 2.144              | 305.94               | 7.007                 | 294.50            | 0.00728            |
| TAKEOFF                            | 1.000               | 15500.0       | 2.017                     | 9485.969              | 1.000              | 0.70                    | 0.024              | 110.67               | 0.213                 | 180.83            | 0.00013            |
| CLIMBOUT                           | 0.850               | 13175.0       | 1.920                     | 7814.688              | 1.000              | 2.20                    | 0.070              | 286.54               | 0.246                 | 483.08            | 0.00015            |
| APPROACH                           | 0.400               | 6200.0        | 2.530                     | 3672.174              | 1.000              | 4.00                    | 0.169              | 244.81               | 0.689                 | 413.33            | 0.00041            |
| TAXI-IDLE                          | 0.060               | 930.0         | 6.769                     | 966.115               | 1.000              | 7.00                    | 0.790              | 112.71               | 7.007                 | 108.50            | 0.00728            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.196              | 1060.67              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.013              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.159              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.519              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 3.995                     | 966.115               | 1.000              | 19.00                   | 1.265               | 305.94               | 4.135                 | 294.50            | 0.00430            |
| TAKEOFF                            | 1.000               | 15500.0       | 261.961                   | 9485.969              | 1.000              | 0.70                    | 3.056               | 110.67               | 27.616                | 180.83            | 0.01690            |
| CLIMBOUT                           | 0.850               | 13175.0       | 161.697                   | 7814.688              | 1.000              | 2.20                    | 5.929               | 286.54               | 20.691                | 483.08            | 0.01227            |
| APPROACH                           | 0.400               | 6200.0        | 37.345                    | 3672.174              | 1.000              | 4.00                    | 2.490               | 244.81               | 10.170                | 413.33            | 0.00602            |
| TAXI-IDLE                          | 0.060               | 930.0         | 3.995                     | 966.115               | 1.000              | 7.00                    | 0.466               | 112.71               | 4.135                 | 108.50            | 0.00430            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 13.206              | 1060.67              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 12.450              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.921               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 197.175             |                      |                       |                   |                    |

DATE: 6/23/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 150 ENGINE TYPE AND MODEL: JTRD

SERIAL NUMBER: X-370-478

RATED THRUST: 15500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HNT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANF OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C

FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.29 FINISH 83.29

ATMOSPHERIC PRESSURE: START 29.82 FINISH 29.80

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0108

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 15.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

BURNFR = 409-H

| CLOCK TIME | TEST MODE | THRUST, LBS ON SHP | POWER, HP | PERCENT RATED T.O. | ENGINE SPEED, RPM | N1      | N2     | MEASURED FUEL FLOW, LB/HK | GAS GEN AIR FLOW, LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP, DEGREES F | ENGINE PRESSURE RATIO EPP | TURBINE INLET TEMP, DEGREES F |
|------------|-----------|--------------------|-----------|--------------------|-------------------|---------|--------|---------------------------|--------------------------|----------|--------------------------------------|---------------------------|-------------------------------|
| 1341.00    | 1/ 0      | 790.00             | 5         | 2655.00            | 6685.00           | 966.00  | 24.70  | 0.009040                  | 244.80                   | 1.04     | 1001.00                              |                           |                               |
| 1353.00    | 2/ 1      | 1787.00            | 11        | 3765.00            | 8130.00           | 1486.00 | 41.10  | 0.009530                  | 366.00                   | 1.10     | 1128.00                              |                           |                               |
| 1409.00    | 3/ 2      | 6063.00            | 39        | 5595.00            | 10005.00          | 3502.50 | 87.20  | 0.011170                  | 543.00                   | 1.35     | 1340.00                              |                           |                               |
| 1451.00    | 4/ 3      | 9563.00            | 64        | 7190.00            | 10800.00          | 5622.50 | 114.50 | 0.013651                  | 720.70                   | 1.64     | 1405.00                              |                           |                               |
| 1509.00    | 5/ 4      | 13048.00           | 84        | 7845.00            | 11255.00          | 7556.00 | 135.20 | 0.015336                  | 792.00                   | 1.90     | 1770.00                              |                           |                               |
| 1513.00    | 6/ 5      | 15542.00           | 100       | 8515.00            | 11685.00          | 9593.00 | 153.70 | 0.017350                  | 870.20                   | 2.12     | 1922.00                              |                           |                               |
| 1523.00    | 7/ 6      | 12072.00           | 77        | 7625.00            | 11170.00          | 6932.50 | 129.00 | 0.014940                  | 768.80                   | 1.80     | 1720.00                              |                           |                               |
| 1530.00    | 8/ 7      | 6976.00            | 45        | 6404.00            | 10240.00          | 3985.00 | 93.90  | 0.011790                  | 630.80                   | 1.42     | 1360.00                              |                           |                               |
| 1554.00    | 9/ 8      | 4931.00            | 31        | 5652.00            | 9716.00           | 2916.50 | 77.50  | 0.010460                  | 554.00                   | 1.28     | 1275.00                              |                           |                               |
| 1613.00    | 10/ 9     | 1353.00            | 8         | 3269.00            | 7547.00           | 1188.00 | 36.10  | 0.009150                  | 523.50                   | 1.06     | 1038.00                              |                           |                               |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP, DEGREES F | EXHAUST GAS PRESSURE, PSIA | CO (WFT) PPMV | CO 2 (WFT) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WFT) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-----------------------------|----------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 780.00                      | 15.20                      | 211.30        | 1.09                 | 68.50          | 7.00          | 4.50            | 11.50           | -0.00     | -0.00 | -0.00        |
| 11                       | 774.40                      | 15.98                      | 105.80        | 1.28                 | 17.90          | 14.90         | 7.10            | 22.00           | -0.00     | -0.00 | -0.00        |
| 39                       | 763.10                      | 19.59                      | 68.40         | 1.64                 | 7.80           | 44.00         | 8.20            | 52.20           | -0.00     | -0.00 | -0.00        |
| 64                       | 890.60                      | 23.73                      | 16.30         | 2.26                 | 8.30           | 96.40         | 7.40            | 103.80          | -0.00     | -0.00 | -0.00        |
| 84                       | 989.40                      | 27.43                      | 10.60         | 2.66                 | 7.00           | 163.30        | 9.40            | 172.70          | -0.00     | -0.00 | -0.00        |
| 100                      | 1086.00                     | 30.55                      | 8.60          | 3.07                 | 6.30           | 241.60        | 13.10           | 254.70          | -0.00     | -0.00 | -0.00        |
| 77                       | 965.10                      | 25.97                      | 11.70         | 2.51                 | 6.20           | 142.90        | 10.00           | 152.90          | -0.00     | -0.00 | -0.00        |
| 45                       | 803.80                      | 20.56                      | 27.50         | 1.47                 | 7.20           | 53.80         | 4.60            | 62.40           | -0.00     | -0.00 | -0.00        |
| 31                       | 735.00                      | 18.66                      | 49.20         | 1.46                 | 9.10           | 34.10         | 10.10           | 44.20           | -0.00     | -0.00 | -0.00        |
| 8                        | 764.40                      | 31.67                      | 132.00        | 1.14                 | 28.80          | 14.50         | 8.20            | 22.70           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO, LB/1K LB FUEL | MASS FMI HC, LB/1K LB FUEL | MASS FMI NO2, LB/1K LB FUEL | MASS FMI CO2, LB/1K LB FUEL | MASS FMI NO, LB/1K LB FUEL | MASS FMI NOX, LB/1K LB FUEL | MASS FMI CO, LB/HR | MASS FMI HC, LB/HR | MASS FMI NO2, LB/HR | MASS FMI CO2, LB/HR | MASS FMI NO, LB/HR | MASS FMI NOX, LB/HR |
|--------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| 5                        | 37.74                      | 7.01                       | 1.32                        | 3059.22                     | 2.05                       | 3.37                        | 36.46              | 6.77               | 1.28                | 2955.20             | 1.98               | 3.26                |
| 11                       | 16.15                      | 1.58                       | 1.80                        | 3107.72                     | 3.78                       | 5.58                        | 24.33              | 2.36               | 2.68                | 4624.28             | 5.63               | 8.31                |
| 39                       | 8.29                       | 0.54                       | 1.63                        | 3123.23                     | 8.76                       | 10.39                       | 29.04              | 1.90               | 5.72                | 10939.12            | 30.68              | 36.40               |
| 64                       | 1.44                       | 0.42                       | 1.07                        | 3134.33                     | 13.98                      | 14.05                       | 8.09               | 2.36               | 6.03                | 17622.78            | 78.58              | 84.61               |
| 84                       | 0.80                       | 0.30                       | 1.16                        | 3135.67                     | 20.12                      | 21.28                       | 6.01               | 2.27               | 8.75                | 23693.12            | 192.06             | 160.81              |
| 100                      | 0.56                       | 0.23                       | 1.40                        | 3136.22                     | 25.80                      | 27.20                       | 5.36               | 2.25               | 11.42               | 30085.79            | 247.52             | 260.94              |
| 77                       | 0.93                       | 0.28                       | 1.31                        | 3135.51                     | 18.66                      | 19.97                       | 6.45               | 1.96               | 9.05                | 21716.91            | 129.37             | 138.42              |
| 45                       | 3.28                       | 0.49                       | 1.69                        | 3131.24                     | 10.55                      | 12.23                       | 13.08              | 1.96               | 6.72                | 12477.99            | 42.02              | 48.74               |
| 31                       | 6.70                       | 0.71                       | 2.26                        | 3125.77                     | 7.63                       | 9.89                        | 19.55              | 2.07               | 6.59                | 9114.84             | 22.26              | 28.85               |
| 8                        | 22.80                      | 2.85                       | 2.33                        | 3094.10                     | 4.11                       | 6.44                        | 27.09              | 3.38               | 2.76                | 3675.79             | 4.89               | 7.65                |

| POWER PERCENT RATED T.O. | CO, LB/1K*TH-HR | CO 2, LB/1K*TH-HR | THC, LB/1K*TH-HR | NO, LB/1K*TH-HR | NO 2, LB/1K*TH-HR | NO X, LB/1K*TH-HR |
|--------------------------|-----------------|-------------------|------------------|-----------------|-------------------|-------------------|
| 5                        | 16.152          | 3740.765          | 8.569            | 2.511           | 1.614             | 4.126             |
| 11                       | 13.651          | 2594.996          | 1.323            | 3.158           | 1.505             | 4.563             |
| 39                       | 4.789           | 1304.242          | 0.313            | 5.060           | 0.943             | 6.003             |
| 64                       | 0.812           | 1768.823          | 0.237            | 7.887           | 0.605             | 4.493             |
| 84                       | 0.461           | 1815.843          | 0.174            | 11.654          | 0.671             | 12.325            |
| 100                      | 0.344           | 1929.565          | 0.144            | 15.875          | 0.861             | 16.735            |
| 77                       | 0.534           | 1900.606          | 0.162            | 10.717          | 0.750             | 11.467            |
| 45                       | 1.875           | 1788.703          | 0.281            | 6.024           | 0.963             | 6.987             |
| 31                       | 3.964           | 1848.477          | 0.420            | 4.513           | 1.337             | 5.850             |
| 8                        | 20.021          | 2716.774          | 2.502            | 3.612           | 2.043             | 5.655             |

CAL ID NUMBER: 150 ENGINE TYPE AND MODEL: JT8D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: K-370-478

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 39.756                    | 962.141               | 1.000              | 19.00                   | 12.589             | 304.68               | 41.320                | 294.50            | 0.04275            |
| TAKEOFF                            | 1.000               | 15500.0       | 5.981                     | 9178.480              | 1.000              | 0.70                    | 0.065              | 107.08               | 0.608                 | 180.83            | 0.00036            |
| CLIMBOUT                           | 0.850               | 13175.0       | 6.952                     | 7656.805              | 1.000              | 2.20                    | 0.255              | 280.75               | 0.908                 | 483.08            | 0.00053            |
| APPROACH                           | 0.400               | 6200.0        | 18.183                    | 3631.703              | 1.000              | 4.00                    | 1.212              | 242.11               | 5.007                 | 413.33            | 0.00293            |
| TAXI-IDLE                          | 0.060               | 930.0         | 39.756                    | 962.141               | 1.000              | 7.00                    | 4.638              | 112.25               | 41.320                | 108.50            | 0.04275            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 18.760             | 1046.87              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 17.920             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 12.673             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.420              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 5.179                     | 962.141               | 1.000              | 19.00                   | 1.640              | 304.68               | 5.383                 | 294.50            | 0.00557            |
| TAKEOFF                            | 1.000               | 15500.0       | 2.326                     | 9178.480              | 1.000              | 0.70                    | 0.027              | 107.08               | 0.253                 | 180.83            | 0.00015            |
| CLIMBOUT                           | 0.850               | 13175.0       | 2.053                     | 7656.805              | 1.000              | 2.20                    | 0.075              | 280.75               | 0.268                 | 483.08            | 0.00016            |
| APPROACH                           | 0.400               | 6200.0        | 2.171                     | 3631.703              | 1.000              | 4.00                    | 0.145              | 242.11               | 0.598                 | 413.33            | 0.00035            |
| TAXI-IDLE                          | 0.060               | 930.0         | 5.179                     | 962.141               | 1.000              | 7.00                    | 0.604              | 112.25               | 5.383                 | 108.50            | 0.00557            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.491              | 1046.87              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.380              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.683              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.751              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 4.214                     | 962.141               | 1.000              | 19.00                   | 1.335               | 304.68               | 4.380                 | 294.50            | 0.00453            |
| TAKEOFF                            | 1.000               | 15500.0       | 252.277                   | 9178.480              | 1.000              | 0.70                    | 2.943               | 107.08               | 27.486                | 180.83            | 0.01628            |
| CLIMBOUT                           | 0.850               | 13175.0       | 166.615                   | 7656.805              | 1.000              | 2.20                    | 6.109               | 280.75               | 21.760                | 483.08            | 0.01265            |
| APPROACH                           | 0.400               | 6200.0        | 37.315                    | 3631.703              | 1.000              | 4.00                    | 2.488               | 242.11               | 10.275                | 413.33            | 0.00602            |
| TAXI-IDLE                          | 0.060               | 930.0         | 4.214                     | 962.141               | 1.000              | 7.00                    | 0.492               | 112.25               | 4.380                 | 108.50            | 0.00453            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 13.366              | 1046.87              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 12.768              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.030               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 189.886             |                      |                       |                   |                    |

DATE: 6/23/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 151 ENGINE TYPE AND MODEL: JT8D SERIAL NUMBER: X-370-470

RATED THRUST: 15500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 81.41 FINISH 77.48

ATMOSPHERIC PRESSURE: START 29.81 FINISH 29.84

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0151

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

BURNER = 409 H

| CLOCK TIME | TEST MODE | THRUST OR SHP | POWER LAS PERCENT RATED T.C. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO | TURBINE INLET TEMP DEGREES F |
|------------|-----------|---------------|------------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|-----------------------|------------------------------|
| 1802.00    | 1/ 0      | 791.00        | 5                            | 2638.00          | 6679.00                  | 970.00                  | 29.70    | 0.009080                            | 261.30                | 1.04                         |
| 1821.00    | 2/ 1      | 1825.00       | 11                           | 2815.00          | 8194.00                  | 1539.00                 | 43.18    | 0.009910                            | 369.30                | 1.10                         |
| 1833.00    | 3/ 2      | 5991.00       | 38                           | 6045.00          | 9473.00                  | 3485.50                 | 86.18    | 0.011240                            | 588.30                | 1.35                         |
| 1852.00    | 4/ 3      | 4990.00       | 64                           | 7177.00          | 10772.00                 | 5779.00                 | 115.54   | 0.013920                            | 708.70                | 1.63                         |
| 1910.00    | 5/ 4      | 13001.00      | 83                           | 7807.00          | 11208.00                 | 7654.50                 | 136.27   | 0.015640                            | 778.30                | 1.89                         |
| 1916.00    | 6/ 5      | 15579.00      | 100                          | 8472.00          | 11627.00                 | 9650.50                 | 154.92   | 0.017318                            | 856.70                | 2.13                         |
| 1930.00    | 7/ 6      | 12023.00      | 77                           | 7581.00          | 11056.00                 | 6986.00                 | 129.26   | 0.015025                            | 755.80                | 1.80                         |
| 1933.00    | 8/ 7      | 6932.00       | 44                           | 6355.00          | 10182.00                 | 4012.50                 | 94.31    | 0.011828                            | 618.00                | 1.42                         |
| 1950.00    | 9/ 8      | 4963.00       | 32                           | 5632.00          | 9677.00                  | 2981.00                 | 78.00    | 0.010620                            | 543.30                | 1.29                         |
| 2008.00    | 10/ 9     | 1174.00       | 7                            | 3067.00          | 7252.00                  | 1136.00                 | 34.07    | 0.009270                            | 295.70                | 1.06                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|----------|-------|--------------|
| 5                        | 789.40                     | 15.21                     | 295.00        | 1.20                 | 60.10          | 6.10          | 7.80            | 13.90           | -0.00    | -0.00 | -0.00        |
| 11                       | 785.00                     | 16.00                     | 125.60        | 1.42                 | 24.60          | 12.40         | 7.00            | 19.40           | -0.00    | -0.00 | -0.00        |
| 38                       | 780.60                     | 19.55                     | 46.90         | 1.74                 | 8.50           | 35.80         | 7.40            | 43.20           | -0.00    | -0.00 | -0.00        |
| 64                       | 910.60                     | 23.59                     | 16.60         | 2.44                 | 5.30           | 84.30         | 7.30            | 91.60           | -0.00    | -0.00 | -0.00        |
| 83                       | 1002.50                    | 27.25                     | 12.20         | 2.93                 | 4.00           | 144.30        | 9.10            | 153.40          | -0.00    | -0.00 | -0.00        |
| 100                      | 1100.00                    | 30.61                     | 9.50          | 3.36                 | 3.90           | 225.90        | 11.60           | 237.70          | -0.00    | -0.00 | -0.00        |
| 77                       | 975.40                     | 26.03                     | 14.70         | 2.79                 | 3.60           | 120.60        | 9.00            | 124.60          | -0.00    | -0.00 | -0.00        |
| 44                       | 808.70                     | 20.53                     | 37.70         | 1.88                 | 5.70           | 54.00         | 7.70            | 61.70           | -0.00    | -0.00 | -0.00        |
| 32                       | 741.90                     | 18.67                     | 62.40         | 1.56                 | 9.00           | 28.00         | 8.80            | 36.80           | -0.00    | -0.00 | -0.00        |
| 7                        | 760.60                     | 15.46                     | 178.00        | 1.23                 | 52.50          | 9.00          | 6.00            | 15.00           | -0.00    | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 46.20                     | 5.58                      | 2.08                       | 3056.62                    | 1.62                      | 3.70                       | 44.82             | 5.41              | 2.01               | 2964.93            | 1.58              | 3.59               |
| 11                       | 17.52                     | 1.96                      | 1.60                       | 3111.61                    | 2.84                      | 4.44                       | 26.96             | 3.02              | 2.47               | 4788.77            | 4.37              | 6.84               |
| 38                       | 5.38                      | 0.56                      | 1.39                       | 3134.55                    | 6.74                      | 8.14                       | 18.74             | 1.95              | 4.86               | 10925.46           | 21.50             | 28.36              |
| 64                       | 1.61                      | 0.25                      | 0.98                       | 3141.32                    | 11.35                     | 12.33                      | 9.28              | 1.44              | 5.68               | 18153.68           | 65.57             | 71.24              |
| 83                       | 0.83                      | 0.16                      | 1.02                       | 3142.79                    | 16.14                     | 17.20                      | 6.38              | 1.20              | 7.81               | 24062.74           | 123.89            | 131.70             |
| 100                      | 0.57                      | 0.13                      | 1.15                       | 3143.27                    | 22.04                     | 23.25                      | 5.46              | 1.28              | 11.14              | 30334.14           | 213.20            | 224.34             |
| 77                       | 1.00                      | 0.15                      | 1.05                       | 3142.54                    | 14.20                     | 15.26                      | 7.01              | 1.03              | 7.40               | 21953.79           | 99.21             | 106.61             |
| 44                       | 4.00                      | 0.35                      | 1.34                       | 3137.28                    | 9.42                      | 10.76                      | 16.07             | 1.30              | 5.39               | 12589.34           | 37.90             | 43.19              |
| 32                       | 7.97                      | 0.66                      | 1.85                       | 3130.20                    | 5.87                      | 7.72                       | 23.75             | 1.96              | 5.50               | 9331.12            | 17.51             | 23.01              |
| 7                        | 28.43                     | 4.80                      | 1.57                       | 3086.68                    | 2.36                      | 3.94                       | 32.30             | 5.46              | 1.79               | 3506.47            | 7.68              | 4.47               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 56.458         | 3748.325         | 6.443           | 1.992          | 2.547            | 4.539            |
| 11                       | 14.771         | 2623.483         | 1.657           | 2.395          | 1.352            | 3.748            |
| 38                       | 3.128          | 1873.645         | 0.325           | 3.922          | 0.811            | 4.733            |
| 64                       | 0.929          | 1817.185         | 0.144           | 6.563          | 0.568            | 7.132            |
| 83                       | 0.490          | 1850.838         | 0.092           | 9.529          | 0.601            | 10.130           |
| 100                      | 0.350          | 1947.118         | 0.082           | 13.685         | 0.715            | 14.400           |
| 77                       | 0.581          | 1825.982         | 0.086           | 8.251          | 0.616            | 8.867            |
| 44                       | 2.318          | 1815.475         | 0.201           | 5.453          | 0.778            | 6.230            |
| 32                       | 4.786          | 1880.137         | 0.395           | 3.528          | 1.109            | 4.637            |
| 7                        | 27.509         | 2986.773         | 4.647           | 2.285          | 1.923            | 3.808            |

CAL ID NUMBER: 151 ENGINE TYPE AND MODEL: JT8D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-370-47C

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 60.595                    | 1050.830              | 1.000              | 19.00                   | 19.188             | 332.76               | 57.664                | 294.50            | 0.06516            |
| TAKEOFF                            | 1.000               | 15500.0       | 8.049                     | 9618.285              | 1.000              | 0.70                    | 0.094              | 112.21               | 0.837                 | 180.83            | 0.00052            |
| CLIMBOUT                           | 0.850               | 13175.0       | 10.278                    | 7902.832              | 1.000              | 2.20                    | 0.377              | 289.77               | 1.301                 | 483.08            | 0.00078            |
| APPROACH                           | 0.400               | 6200.0        | 21.374                    | 3810.882              | 1.000              | 4.00                    | 1.425              | 254.06               | 5.609                 | 413.33            | 0.00345            |
| TAXI-IDLE                          | 0.060               | 930.0         | 60.595                    | 1050.830              | 1.000              | 7.00                    | 7.069              | 122.60               | 57.664                | 108.50            | 0.06516            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 28.153             | 1111.40              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 25.331             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 19.019             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.606              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 5.869                     | 1050.830              | 1.000              | 19.00                   | 1.858              | 332.76               | 5.585                 | 294.50            | 0.00631            |
| TAKEOFF                            | 1.000               | 15500.0       | 1.500                     | 9618.285              | 1.000              | 0.70                    | 0.018              | 112.21               | 0.156                 | 180.83            | 0.00010            |
| CLIMBOUT                           | 0.850               | 13175.0       | 1.233                     | 7902.832              | 1.000              | 2.20                    | 0.045              | 289.77               | 0.156                 | 483.08            | 0.00009            |
| APPROACH                           | 0.400               | 6200.0        | 2.256                     | 3810.882              | 1.000              | 4.00                    | 0.150              | 254.06               | 0.592                 | 413.33            | 0.00036            |
| TAXI-IDLE                          | 0.060               | 930.0         | 5.869                     | 1050.830              | 1.000              | 7.00                    | 0.685              | 122.60               | 5.585                 | 108.50            | 0.00631            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.756              | 1111.40              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.480              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.862              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.129              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 3.287                     | 1050.830              | 1.000              | 19.00                   | 1.041               | 332.76               | 3.128                 | 294.50            | 0.00353            |
| TAKEOFF                            | 1.000               | 15500.0       | 224.084                   | 9618.285              | 1.000              | 0.70                    | 2.614               | 112.21               | 23.298                | 180.83            | 0.01446            |
| CLIMBOUT                           | 0.850               | 13175.0       | 137.551                   | 7902.832              | 1.000              | 2.20                    | 5.044               | 289.77               | 17.405                | 483.08            | 0.01044            |
| APPROACH                           | 0.400               | 6200.0        | 32.194                    | 3810.882              | 1.000              | 4.00                    | 2.146               | 254.06               | 8.448                 | 413.33            | 0.00519            |
| TAXI-IDLE                          | 0.060               | 930.0         | 3.287                     | 1050.830              | 1.000              | 7.00                    | 0.383               | 122.60               | 3.128                 | 108.50            | 0.00353            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 11.228              | 1111.40              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.103              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.586               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 168.665             |                      |                       |                   |                    |

DATE: 6/24/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 152 ENGINE TYPE AND MODEL: J18D SERIAL NUMBER: X-370-47D

RATED THRUST: 15500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.45 FINISH 86.66

ATMOSPHERIC PRESSURE: START 29.86 FINISH 29.81

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0152

RELATIVE HUMIDITY: 75.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 4

COMMENTS:

BURNER = 409 H

| CLOCK TIME | TEST MODE | THRUST LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|-------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 952.00     | 1/ 0      | 4992.00           | 32                       | 5640.00          | 9670.00                  | 2981.50                 | 0.010540 | 537.00                              | 1.29                      | 1259.80                      |
| 1123.00    | 2/ 1      | 14510.00          | 93                       | 8200.00          | 11465.00                 | 8792.00                 | 0.016560 | 825.80                              | 2.03                      | 1871.60                      |
| 1320.00    | 3/ 2      | 12686.00          | 81                       | 7785.00          | 11275.00                 | 7462.50                 | 0.014670 | 619.50                              | 1.88                      | 1590.70                      |
| 1433.00    | 4/ 3      | 1374.00           | 8                        | 3105.00          | 7545.00                  | 1390.00                 | 0.010730 | 328.80                              | 1.08                      | 1074.50                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 32                       | 737.80                     | 18.71                     | 59.90         | 3.55                 | 9.40           | 25.60         | 6.10            | 31.70           | -0.00     | -0.00 | -0.00        |
| 93                       | 1058.00                    | 29.22                     | 10.30         | 2.74                 | 5.80           | 178.90        | 9.50            | 188.40          | -0.00     | -0.00 | -0.00        |
| 81                       | 1013.10                    | 27.06                     | 11.20         | 2.88                 | 5.90           | 147.10        | 7.50            | 154.60          | -0.00     | -0.00 | -0.00        |
| 8                        | 785.90                     | 15.81                     | 151.40        | 0.59                 | 35.70          | 7.90          | 10.60           | 18.50           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 32                       | 3.37                      | 0.30                      | 7.56                       | 3133.40                    | 2.37                      | 2.93                       | 10.05             | 0.90              | 1.68               | 9357.13            | 7.05              | 8.73               |
| 93                       | 0.75                      | 0.24                      | 1.14                       | 3142.58                    | 21.45                     | 22.59                      | 6.61              | 2.13              | 10.01              | 27630.41           | 188.59            | 198.61             |
| 81                       | 0.92                      | 0.23                      | 0.86                       | 3142.44                    | 16.78                     | 17.63                      | 6.34              | 1.75              | 6.38               | 23450.45           | 125.21            | 131.60             |
| 8                        | 49.78                     | 6.72                      | 5.72                       | 3047.87                    | 4.27                      | 9.99                       | 69.19             | 9.34              | 7.96               | 4236.54            | 5.93              | 13.89              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 32                       | 2.013          | 1874.051         | 0.181           | 1.413          | 0.337            | 1.749            |
| 93                       | 0.466          | 1904.232         | 0.147           | 12.998         | 0.690            | 13.689           |
| 81                       | 0.519          | 1843.570         | 0.138           | 9.870          | 0.501            | 10.374           |
| 8                        | 50.357         | 3083.360         | 6.801           | 4.316          | 5.791            | 10.107           |

CAL ID NUMBER: 152 ENGINE TYPE AND MODEL: JT8D SERIAL NUMBER: X-370-470  
TEST ORGANIZATION: PRATT & WHITNEY

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 102.156                   | 1098.224              | 1.000              | 19.00                   | 32.349             | 347.77               | 93.019                | 294.50            | 0.10985            |
| TAKEOFF                            | 1.000               | 15500.0       | 7.318                     | 9470.844              | 1.000              | 0.70                    | 0.085              | 110.49               | 0.773                 | 180.83            | 0.00047            |
| CLIMBOUT                           | 0.850               | 13175.0       | 7.467                     | 7812.359              | 1.000              | 2.20                    | 0.274              | 286.45               | 0.956                 | 483.08            | 0.00057            |
| APPROACH                           | 0.400               | 6200.0        | 11.633                    | 3713.650              | 1.000              | 4.00                    | 0.776              | 247.58               | 3.132                 | 413.33            | 0.00188            |
| TAXI-IDLE                          | 0.060               | 930.0         | 102.156                   | 1098.224              | 1.000              | 7.00                    | 11.918             | 128.13               | 93.019                | 108.50            | 0.10985            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 45.402             | 1120.42              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 40.523             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 30.672             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.551              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 17.517                    | 1098.224              | 1.000              | 19.00                   | 5.547              | 347.77               | 15.950                | 294.50            | 0.01884            |
| TAKEOFF                            | 1.000               | 15500.0       | 2.394                     | 9470.844              | 1.000              | 0.70                    | 0.028              | 110.49               | 0.253                 | 180.83            | 0.00015            |
| CLIMBOUT                           | 0.850               | 13175.0       | 2.057                     | 7812.359              | 1.000              | 2.20                    | 0.075              | 286.45               | 0.263                 | 483.08            | 0.00016            |
| APPROACH                           | 0.400               | 6200.0        | 1.399                     | 3713.650              | 1.000              | 4.00                    | 0.093              | 247.58               | 0.377                 | 413.33            | 0.00023            |
| TAXI-IDLE                          | 0.060               | 930.0         | 17.517                    | 1098.224              | 1.000              | 7.00                    | 2.044              | 128.13               | 15.950                | 108.50            | 0.01884            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.787              | 1120.42              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 6.950              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.261              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.802              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 930.0         | 0.689                     | 1098.224              | 1.000              | 19.00                   | 0.218               | 347.77               | 0.627                 | 294.50            | 0.00074            |
| TAKEOFF                            | 1.000               | 15500.0       | 239.545                   | 9470.844              | 1.000              | 0.70                    | 2.795               | 110.49               | 25.293                | 180.83            | 0.01545            |
| CLIMBOUT                           | 0.850               | 13175.0       | 150.127                   | 7812.359              | 1.000              | 2.20                    | 5.505               | 286.45               | 19.217                | 483.08            | 0.01139            |
| APPROACH                           | 0.400               | 6200.0        | 19.373                    | 3713.650              | 1.000              | 4.00                    | 1.292               | 247.58               | 5.217                 | 413.33            | 0.00312            |
| TAXI-IDLE                          | 0.060               | 930.0         | 0.689                     | 1098.224              | 1.000              | 7.00                    | 0.080               | 128.13               | 0.627                 | 108.50            | 0.00074            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.889               | 1120.42              |                       | 1480.25           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 8.826               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.681               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 180.303             |                      |                       |                   |                    |

DATE: 7/14/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 90 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 654458

RATED THRUST: 14000.

ENGINE TOTAL TIME: 8340. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: 0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 98.00 FINISH 99.00

ATMOSPHERIC PRESSURE: START 14.35 FINISH 14.35

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 30.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 134.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 7

COMMENTS:

H/C IS CAL-ESTIMATED  
 TEMP. SAMPLELINE AVERAGED  
 TOP ARM OF PROBE FAILED DURING 2ND LAST RUN  
 WITH RETROFIT

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1100.00    | 1/ 0      | 970.00             | 6                        | 2948.00          | 7275.00                  | 1133.00                 | -0.00    | -0.000000                           | 1.01                      | 98.00                        |
| 105.00     | 6/ 1      | 9580.00            | 61                       | 7177.00          | 11055.00                 | 5190.00                 | -0.00    | -0.000000                           | 2.12                      | 98.00                        |
| 110.00     | 1/ 6      | 990.00             | 7                        | 2965.00          | 7317.00                  | 1024.00                 | -0.00    | -0.000000                           | 1.01                      | 99.00                        |
| 115.00     | 4/ 1      | 10110.00           | 72                       | 7534.00          | 11340.00                 | 6150.00                 | -0.00    | -0.000000                           | 2.36                      | 99.00                        |
| 1.20       | 3/ 4      | 11130.00           | 79                       | 7773.00          | 11548.00                 | 6770.00                 | -0.00    | -0.000000                           | 2.54                      | 99.00                        |
| 125.00     | 2/ 1      | 12020.00           | 85                       | 7984.00          | 11687.00                 | 7410.00                 | -0.00    | -0.000000                           | 2.69                      | 99.00                        |
| 130.00     | 1/ 2      | 980.00             | 6                        | 2972.00          | 7327.00                  | 1030.00                 | -0.00    | -0.000000                           | 1.01                      | 99.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 6                        | 715.00                     | 15.60                     | 87.00         | 0.71                 | 24.20          | 4.10          | 3.00            | 7.10            | 2.71      | -0.00 | -0.00        |
| 61                       | 900.00                     | 30.70                     | 19.50         | 1.98                 | 2.70           | 111.00        | 8.50            | 119.50          | 0.26      | -0.00 | -0.00        |
| 7                        | 735.00                     | 15.60                     | 83.00         | 0.69                 | 23.30          | 4.60          | 3.00            | 7.60            | -0.00     | -0.00 | -0.00        |
| 72                       | 940.00                     | 34.40                     | 19.20         | 1.98                 | 1.70           | 90.00         | 9.00            | 99.00           | 0.23      | -0.00 | -0.00        |
| 79                       | 990.00                     | 37.10                     | 19.20         | 2.07                 | 1.60           | 108.00        | 10.00           | 118.00          | 0.27      | -0.00 | -0.00        |
| 85                       | 1020.00                    | 39.20                     | 19.50         | 2.19                 | 1.30           | 130.00        | 11.00           | 141.00          | 0.36      | -0.00 | -0.00        |
| 6                        | 715.00                     | 15.60                     | 91.00         | 1.00                 | 35.00          | 8.50          | 5.00            | 13.50           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 6                        | 24.23                     | 3.86                      | 1.37                       | 3107.22                    | 1.89                      | 3.25                       | 27.46             | 4.17              | 1.56               | 3520.48            | 2.13              | 3.68               |
| 61                       | 1.98                      | 0.13                      | 1.41                       | 3152.44                    | 18.48                     | 19.89                      | 10.26             | 0.66              | 7.34               | 14361.14           | 95.89             | 103.23             |
| 7                        | 23.79                     | 3.83                      | 1.41                       | 3104.01                    | 2.17                      | 3.58                       | 24.37             | 3.92              | 1.45               | 3182.60            | 2.22              | 3.66               |
| 72                       | 1.84                      | 0.10                      | 1.50                       | 3152.72                    | 14.98                     | 16.48                      | 11.34             | 0.61              | 9.21               | 19389.24           | 92.13             | 101.35             |
| 79                       | 1.76                      | 0.09                      | 1.59                       | 3152.87                    | 17.20                     | 18.79                      | 11.94             | 0.60              | 10.78              | 21344.95           | 116.42            | 127.70             |
| 85                       | 1.70                      | 0.07                      | 1.66                       | 3152.90                    | 19.57                     | 21.22                      | 13.24             | 0.51              | 12.27              | 23362.95           | 144.98            | 157.25             |
| 6                        | 18.05                     | 3.99                      | 1.63                       | 3116.62                    | 2.77                      | 4.40                       | 18.59             | 4.10              | 1.68               | 3210.12            | 2.85              | 4.53               |

| POWER PERCENT RATED T.O. | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 6                        | 28.304         | 3629.363         | 4.509           | 2.191          | 1.603            | 3.794            |
| 61                       | 1.195          | 1906.893         | 0.077           | 11.175         | 0.656            | 12.031           |
| 7                        | 24.611         | 3214.744         | 3.557           | 2.240          | 1.461            | 3.702            |
| 72                       | 1.122          | 1917.828         | 0.060           | 9.113          | 0.911            | 10.024           |
| 79                       | 1.073          | 1917.796         | 0.054           | 10.460         | 0.969            | 11.429           |
| 85                       | 1.101          | 1943.673         | 0.042           | 12.062         | 1.021            | 13.082           |
| 6                        | 18.971         | 3275.630         | 4.179           | 2.911          | 1.712            | 4.623            |

CAL ID NUMBER: 90 ENGINE TYPE AND MODEL: JT8D-1

SERIAL NUMBER: 654458

TEST ORGANIZATION: U.S. BUREAU OF MINES

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 19.393                    | 891.559               | 1.000              | 19.00                   | 6.141              | 282.33               | 21.751                | 266.00            | 0.02309            |
| TAKEOFF   | 1.000               | 14000.0       | 10.484                    | 8910.309              | 1.000              | 0.70                    | 0.122              | 103.95               | 1.177                 | 163.33            | 0.00075            |
| CLIMBOUT  | 0.850               | 11900.0       | 10.594                    | 7423.398              | 1.000              | 2.20                    | 0.388              | 272.19               | 1.427                 | 436.33            | 0.00089            |
| APPROACH  | 0.400               | 5600.0        | 14.186                    | 3520.968              | 1.000              | 4.00                    | 0.946              | 234.73               | 4.029                 | 373.33            | 0.00253            |
| TAXI-IDLE | 0.060               | 840.0         | 19.393                    | 891.559               | 1.000              | 7.00                    | 2.262              | 104.02               | 21.751                | 98.00             | 0.02309            |

TOTAL FOR CYCLE: 9.860  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 9.887  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.375  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.874

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 3.824                     | 891.559               | 1.000              | 19.00                   | 1.211              | 282.33               | 4.289                 | 266.00            | 0.00455            |
| TAKEOFF   | 1.000               | 14000.0       | 0.326                     | 8910.309              | 1.000              | 0.70                    | 0.004              | 103.95               | 0.037                 | 163.33            | 0.00002            |
| CLIMBOUT  | 0.850               | 11900.0       | 0.423                     | 7423.398              | 1.000              | 2.20                    | 0.015              | 272.19               | 0.057                 | 436.33            | 0.00004            |
| APPROACH  | 0.400               | 5600.0        | 0.837                     | 3520.968              | 1.000              | 4.00                    | 0.056              | 234.73               | 0.238                 | 373.33            | 0.00015            |
| TAXI-IDLE | 0.060               | 840.0         | 3.824                     | 891.559               | 1.000              | 7.00                    | 0.446              | 104.02               | 4.289                 | 98.00             | 0.00455            |

TOTAL FOR CYCLE: 1.732  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 1.737  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.295  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.271

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 3.096                     | 891.559               | 1.000              | 19.00                   | 0.980               | 282.33               | 3.472                 | 266.00            | 0.00369            |
| TAKEOFF   | 1.000               | 14000.0       | 231.395                   | 8910.309              | 1.000              | 0.70                    | 2.700               | 103.95               | 25.969                | 163.33            | 0.01653            |
| CLIMBOUT  | 0.850               | 11900.0       | 151.836                   | 7423.398              | 1.000              | 2.20                    | 5.567               | 272.19               | 20.454                | 436.33            | 0.01276            |
| APPROACH  | 0.400               | 5600.0        | 40.701                    | 3520.968              | 1.000              | 4.00                    | 2.713               | 234.73               | 11.560                | 373.33            | 0.00727            |
| TAXI-IDLE | 0.060               | 840.0         | 3.096                     | 891.559               | 1.000              | 7.00                    | 0.361               | 104.02               | 3.472                 | 98.00             | 0.00369            |

TOTAL FOR CYCLE: 12.322  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 12.356  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 9.216  
 LBS POLLUTANT/1000K LB TH AT T.O.: 192.829

DATE: 7/13/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 132 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 649340  
 RATED THRUST: 14000.  
 ENGINE TOTAL TIME: 13276. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 13535. HRS  
 N2 COMPRESSOR OVERHAUL: 13426. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS  
 FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 53.96 FINISH 53.60  
 ATMOSPHERIC PRESSURE: START 29.75 FINISH 29.75  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0048  
 RELATIVE HUMIDITY: 54.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IS IN INCHES HG.  
 NEW SMOKELESS BURNERS

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|----------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 550.00     | 1/ 0      | 10755.00           | 76                       | 7369.00          | 10949.00 | 6167.00 | -0.00                    | -0.000000               | -0.00    | 1.73                                | -0.00                     |                              |
| 554.00     | 2/ 1      | 12060.00           | 86                       | 7674.00          | 11162.00 | 6946.00 | -0.00                    | -0.000000               | -0.00    | 1.84                                | -0.00                     |                              |
| 557.00     | 3/ 2      | 13433.00           | 95                       | 7714.00          | 11270.00 | 7893.00 | -0.00                    | -0.000000               | -0.00    | 1.96                                | -0.00                     |                              |
| 1442.00    | 4/ 3      | 861.00             | 6                        | 5798.00          | 6976.00  | 1096.00 | -0.00                    | -0.000000               | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 76                       | 865.40                     | 51.50                     | 10.00         | 2.55                 | 2.10           | 104.00        | -0.00           | 126.00          | -0.00     | -0.00 | -0.00        |
| 86                       | 906.80                     | 54.80                     | 10.50         | 2.70                 | 2.10           | 132.00        | -0.00           | 146.00          | -0.00     | -0.00 | -0.00        |
| 95                       | 959.00                     | 58.30                     | 10.50         | 2.85                 | 2.25           | 162.00        | -0.00           | 172.00          | -0.00     | -0.00 | -0.00        |
| 6                        | 687.20                     | 31.30                     | 20.00         | 2.25                 | 15.60          | 2.50          | -0.00           | 3.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 76                       | 0.79                      | 0.09                      | -0.00                      | 3154.34                    | 13.45                     | 16.29                      | 4.86              | 0.58              | -0.00              | 19453.14           | 82.94             | 100.49             |
| 86                       | 0.78                      | 0.09                      | -0.00                      | 3154.42                    | 16.12                     | 17.83                      | 5.42              | 0.62              | -0.00              | 21910.57           | 111.98            | 123.86             |
| 95                       | 0.74                      | 0.09                      | -0.00                      | 3154.48                    | 18.74                     | 19.90                      | 5.84              | 0.72              | -0.00              | 24898.29           | 147.95            | 157.09             |
| 6                        | 1.78                      | 0.80                      | -0.00                      | 3150.00                    | 0.37                      | 0.44                       | 1.94              | 0.86              | -0.00              | 3421.88            | 0.40              | 0.48               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 76                       | 0.451          | 1808.753         | 0.054           | 7.712          | -0.000           | 9.343            |
| 86                       | 0.450          | 1816.797         | 0.052           | 9.285          | -0.000           | 10.270           |
| 95                       | 0.435          | 1853.517         | 0.053           | 11.014         | -0.000           | 11.694           |
| 6                        | 2.248          | 3974.309         | 1.004           | 0.462          | -0.000           | 0.554            |

CAL ID NUMBER: 132 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 649340  
TEST ORGANIZATION: UNITED/EPA

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 2.247                     | 1089.509              | 1.000              | 19.00                   | 0.711              | 345.01               | 2.062                 | 266.00            | 0.00267            |
| TAKEOFF   | 1.000               | 14000.0       | 5.693                     | 8210.797              | 1.000              | 0.70                    | 0.066              | 95.79                | 0.693                 | 163.33            | 0.00041            |
| CLIMBOUT  | 0.850               | 11900.0       | 5.352                     | 7026.547              | 1.000              | 2.20                    | 0.196              | 257.64               | 0.762                 | 436.33            | 0.00045            |
| APPROACH  | 0.400               | 5600.0        | 3.074                     | 3449.023              | 1.000              | 4.00                    | 0.205              | 229.93               | 0.891                 | 373.33            | 0.00055            |
| TAXI-IDLE | 0.060               | 840.0         | 2.247                     | 1089.509              | 1.000              | 7.00                    | 0.262              | 127.11               | 2.062                 | 98.00             | 0.00267            |

TOTAL FOR CYCLE: 1.441 1055.49 1337.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 1.365  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.078  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.474

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 0.869                     | 1089.509              | 1.000              | 19.00                   | 0.275              | 345.01               | 0.798                 | 266.00            | 0.00104            |
| TAKEOFF   | 1.000               | 14000.0       | 0.565                     | 8210.797              | 1.000              | 0.70                    | 0.007              | 95.79                | 0.069                 | 163.33            | 0.00004            |
| CLIMBOUT  | 0.850               | 11900.0       | 0.478                     | 7026.547              | 1.000              | 2.20                    | 0.018              | 257.64               | 0.068                 | 436.33            | 0.00004            |
| APPROACH  | 0.400               | 5600.0        | 0.492                     | 3449.023              | 1.000              | 4.00                    | 0.033              | 229.93               | 0.143                 | 373.33            | 0.00009            |
| TAXI-IDLE | 0.060               | 840.0         | 0.869                     | 1089.509              | 1.000              | 7.00                    | 0.101              | 127.11               | 0.798                 | 98.00             | 0.00104            |

TOTAL FOR CYCLE: 0.434 1055.49 1337.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 0.411  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 0.324  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.471

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 840.0         | 0.438                     | 1089.509              | 1.000              | 19.00                   | 0.139               | 345.01               | 0.402                 | 266.00            | 0.00052            |
| TAKEOFF   | 1.000               | 14000.0       | 167.922                   | 8210.797              | 1.000              | 0.70                    | 1.959               | 95.79                | 20.451                | 163.33            | 0.01199            |
| CLIMBOUT  | 0.850               | 11900.0       | 123.556                   | 7026.547              | 1.000              | 2.20                    | 4.530               | 257.64               | 17.584                | 436.33            | 0.01038            |
| APPROACH  | 0.400               | 5600.0        | 31.446                    | 3449.023              | 1.000              | 4.00                    | 2.096               | 229.93               | 9.117                 | 373.33            | 0.00562            |
| TAXI-IDLE | 0.060               | 840.0         | 0.438                     | 1089.509              | 1.000              | 7.00                    | 0.051               | 127.11               | 0.402                 | 98.00             | 0.00052            |

TOTAL FOR CYCLE: 8.776 1055.49 1337.00  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 8.314  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.564  
 LBS POLLUTANT/1000K LB TH AT T.O.: 139.935

DATE: 7/20/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 291 ENGINE TYPE AND MODEL: JT8D-1

SERIAL NUMBER: 64892D

RATED THRUST: 14000.

ENGINE TOTAL TIME: 15449. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A

FUEL W/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.50 FINISH 29.50

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0080

RELATIVE HUMIDITY: 34.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 135.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.90

NUMBER OF TESTS: 5

COMMENTS:

H/C IS CAL-ESTIMATED  
 PROBE POSITIONED 18" FROM TAILPIPE EXIT PLANE  
 (UNBALANCED PROBE CONFIGURATION REQUIRES MOUNTING NEAR STAND)  
 SAMPLE LINE TEMP. AVERAGED  
 WITH RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED, RPM | MEASURED FUEL FLOW, LB/HR | GAS GEN AIR FLOW, LB/SFC | CALC F/A | COMPRESSOR DISCHARGE TEMP, DEGREES F | ENGINE PRESSURE RATIO, EPR | TURBINE INLET TEMP, DEGREES F |
|------------|-----------|--------------------------|--------------------|-------------------|---------------------------|--------------------------|----------|--------------------------------------|----------------------------|-------------------------------|
| 1130.00    | 1/ 0      | 10900.00                 | 77                 | 7600.00           | 11200.00                  | 6410.00                  | -0.00    | -0.000000                            | -0.00                      | 1.74                          |
| 1135.00    | 2/ 1      | 11980.00                 | 85                 | 7850.00           | 11410.00                  | 7090.00                  | -0.00    | -0.000000                            | -0.00                      | 1.83                          |
| 1145.00    | 3/ 2      | 12760.00                 | 91                 | 8035.00           | 11560.00                  | 7630.00                  | -0.00    | -0.000000                            | -0.00                      | 1.90                          |
| 1150.00    | 4/ 3      | 10400.00                 | 7                  | 2980.00           | 7310.00                   | 1068.00                  | -0.00    | -0.000000                            | -0.00                      | 1.06                          |
| 1205.00    | 5/ 4      | 9610.00                  | 68                 | 7280.00           | 11000.00                  | 5590.00                  | -0.00    | -0.000000                            | -0.00                      | 1.63                          |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP, DEGREES F | EXHAUST GAS PRESSURE, PSIA | CO (WET) PPMV | CO <sub>2</sub> (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO <sub>2</sub> (WET) PPMV | NO <sub>x</sub> (WET) PPMV | ALDEHYDES | SNOKE | PARTICULATES |
|--------------------------|-----------------------------|----------------------------|---------------|---------------------------------|----------------|---------------|----------------------------|----------------------------|-----------|-------|--------------|
| 77                       | 920.00                      | 25.05                      | 16.50         | 2.26                            | 4.30           | 101.80        | 8.50                       | 110.30                     | 0.35      | -0.00 | -0.00        |
| 85                       | 955.00                      | 26.35                      | 17.50         | 2.44                            | 1.70           | 124.10        | 9.00                       | 133.10                     | 0.45      | -0.00 | -0.00        |
| 91                       | 990.00                      | 27.35                      | 17.50         | 2.59                            | 1.30           | 144.90        | 10.00                      | 154.90                     | 0.41      | -0.00 | -0.00        |
| 7                        | 670.00                      | 15.05                      | 101.00        | 0.69                            | 47.50          | 5.10          | 0.80                       | 5.90                       | 4.15      | -0.00 | -0.00        |
| 68                       | 875.00                      | 23.43                      | 20.50         | 2.03                            | 1.70           | 79.10         | 1.80                       | 60.90                      | 0.32      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO, LB FUEL | MASS EMI HC, LB FUEL | MASS EMI NO <sub>2</sub> , LB FUEL | MASS EMI CO <sub>2</sub> , LB FUEL | MASS EMI NO, LB FUEL | MASS EMI NO <sub>x</sub> , LB FUEL | MASS EMI CU, LB/HR | MASS EMI HC, LB/HR | MASS EMI NO <sub>2</sub> , LB/HR | MASS EMI CO <sub>2</sub> , LB/HR | MASS EMI NO, LB/HR | MASS EMI NO <sub>x</sub> , LB/HR |
|--------------------------|----------------------|----------------------|------------------------------------|------------------------------------|----------------------|------------------------------------|--------------------|--------------------|----------------------------------|----------------------------------|--------------------|----------------------------------|
| 77                       | 1.47                 | 0.22                 | 1.24                               | 3152.99                            | 14.85                | 16.09                              | 9.39               | 1.40               | 7.95                             | 20210.64                         | 95.17              | 103.12                           |
| 85                       | 1.44                 | 0.08                 | 1.22                               | 3153.41                            | 16.77                | 17.98                              | 10.21              | 0.57               | 8.62                             | 22357.66                         | 118.87             | 127.50                           |
| 91                       | 1.36                 | 0.06                 | 1.27                               | 3153.60                            | 18.44                | 19.72                              | 10.35              | 0.44               | 9.71                             | 24061.96                         | 140.73             | 150.44                           |
| 7                        | 28.78                | 7.75                 | 0.37                               | 3089.40                            | 2.39                 | 2.76                               | 30.74              | 8.28               | 0.40                             | 3299.48                          | 2.55               | 2.95                             |
| 68                       | 2.03                 | 0.10                 | 0.29                               | 3152.44                            | 12.84                | 13.13                              | 11.33              | 0.54               | 1.63                             | 17622.15                         | 71.78              | 73.42                            |

| POWER PERCENT RATED T.O. | CO, LB/IK#TH-HR | CO <sub>2</sub> , LB/IK#TH-HR | THC, LB/IK#TH-HR | NO, LB/IK#TH-HR | NO <sub>2</sub> , LB/IK#TH-HR | NO <sub>x</sub> , LB/IK#TH-HR |
|--------------------------|-----------------|-------------------------------|------------------|-----------------|-------------------------------|-------------------------------|
| 77                       | 0.862           | 1844.147                      | 0.129            | 8.731           | 0.729                         | 9.460                         |
| 85                       | 0.852           | 1866.249                      | 0.047            | 4.923           | 0.720                         | 10.642                        |
| 91                       | 0.811           | 1845.733                      | 0.035            | 11.024          | 0.761                         | 11.790                        |
| 7                        | 29.556          | 3172.576                      | 7.961            | 2.451           | 0.385                         | 2.836                         |
| 68                       | 1.179           | 1833.730                      | 0.056            | 7.470           | 0.170                         | 7.640                         |

CAL ID NUMBER: 291 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 648920  
TEST ORGANIZATION: U.S. BUREAU OF MINES

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 24.991                    | 834.939               | 1.000              | 19.00                   | 7.914              | 264.40               | 29.931                | 266.00            | 0.02975            |
| TAKEOFF                            | 1.000               | 14000.0       | 9.075                     | 8369.012              | 1.000              | 0.70                    | 0.106              | 97.64                | 1.084                 | 163.33            | 0.00065            |
| CLIMBOUT                           | 0.850               | 11900.0       | 9.353                     | 7057.273              | 1.000              | 2.20                    | 0.343              | 258.77               | 1.325                 | 436.33            | 0.00079            |
| APPROACH                           | 0.400               | 5600.0        | 17.363                    | 3354.049              | 1.000              | 4.00                    | 1.158              | 223.60               | 5.177                 | 373.33            | 0.00310            |
| TAXI-IDLE                          | 0.060               | 840.0         | 24.991                    | 834.939               | 1.000              | 7.00                    | 2.916              | 97.41                | 29.931                | 98.00             | 0.02975            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.436             | 941.81               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.204             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.301              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.756              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 7.643                     | 834.939               | 1.000              | 19.00                   | 2.420              | 264.40               | 9.154                 | 266.00            | 0.00910            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8369.012              | 1.000              | 0.70                    | 0.0                | 97.64                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.642                     | 7057.273              | 1.000              | 2.20                    | 0.024              | 258.77               | 0.091                 | 436.33            | 0.00005            |
| APPROACH                           | 0.400               | 5600.0        | 2.619                     | 3354.049              | 1.000              | 4.00                    | 0.175              | 223.60               | 0.781                 | 373.33            | 0.00047            |
| TAXI-IDLE                          | 0.060               | 840.0         | 7.643                     | 834.939               | 1.000              | 7.00                    | 0.892              | 97.41                | 9.154                 | 98.00             | 0.00910            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.510              | 941.81               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.727              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.625              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.995                     | 834.939               | 1.000              | 19.00                   | 0.632               | 264.40               | 2.389                 | 266.00            | 0.00238            |
| TAKEOFF                            | 1.000               | 14000.0       | 188.105                   | 8369.012              | 1.000              | 0.70                    | 2.195               | 97.64                | 22.476                | 163.33            | 0.01344            |
| CLIMBOUT                           | 0.850               | 11900.0       | 127.245                   | 7057.273              | 1.000              | 2.20                    | 4.666               | 258.77               | 18.030                | 436.33            | 0.01069            |
| APPROACH                           | 0.400               | 5600.0        | 29.583                    | 3354.049              | 1.000              | 4.00                    | 1.972               | 223.60               | 8.820                 | 373.33            | 0.00528            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.995                     | 834.939               | 1.000              | 7.00                    | 0.233               | 97.41                | 2.389                 | 98.00             | 0.00238            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.697               | 941.81               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.296              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.253               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 156.754             |                      |                       |                   |                    |

DATE: 7/21/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBR: 293 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 648822

RATED THRUST: 14000.

ENGINE TOTAL TIME: 14661. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 90.00

ATMOSPHERIC PRESSURE: START 29.30 FINISH 29.30

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0090

RELATIVE HUMIDITY: 27.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 132.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C IS CAL-ESTIMATED  
PROBE LOCATED 18" FROM TAILPIPE EXIT PLANE  
(CONFIG. SAME AS USED ON 7-16-71 TEST)  
N(1) COUNTER NOT OPERATING  
SAMPLE LINE TEMP. AVERAGED  
WITH RETROFIT

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|--------------------|------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 320.00     | 4/ 0      | 970.00             | 6                        | -0.00              | 7225.00          | 1060.00                  | -0.00                   | -0.000000 | -0.00                               | 1.04                      | -0.00                        |
| 345.00     | 1/ 4      | 10080.00           | 71                       | -0.00              | 11165.00         | 5970.00                  | -0.00                   | -0.000000 | -0.00                               | 1.69                      | -0.00                        |
| 350.00     | 2/ 1      | 11640.00           | 83                       | -0.00              | 11410.00         | 7050.00                  | -0.00                   | -0.000000 | -0.00                               | 1.83                      | -0.00                        |
| 355.00     | 3/ 2      | 12450.00           | 88                       | -0.00              | 11535.00         | 7270.00                  | -0.00                   | -0.000000 | -0.00                               | 1.90                      | -0.00                        |
| 400.00     | 4/ 3      | 950.00             | 6                        | -0.00              | 7238.00          | 1012.00                  | -0.00                   | -0.000000 | -0.00                               | 1.04                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NG (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 6                        | 730.00                     | 14.99                     | 188.00        | 0.93                 | -0.00          | 2.20          | 5.00            | 7.20            | 4.53      | -0.00 | -0.00        |
| 71                       | 940.00                     | 23.95                     | 14.00         | 2.24                 | 1.70           | 90.50         | 10.50           | 101.00          | -0.00     | -0.00 | -0.00        |
| 83                       | 995.00                     | 25.88                     | 13.50         | 2.49                 | 2.60           | 122.60        | 12.00           | 134.60          | -0.00     | -0.00 | -0.00        |
| 88                       | 1050.00                    | 26.85                     | 14.00         | 2.57                 | 2.80           | 136.70        | 13.00           | 149.70          | -0.00     | -0.00 | -0.00        |
| 6                        | 730.00                     | 14.99                     | 111.00        | 0.77                 | 46.40          | 4.30          | 4.50            | 8.80            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 6                        | 39.90                     | -0.00                     | 1.74                       | 3093.36                    | 0.76                      | 2.50                       | 42.14             | -0.00             | 1.84               | 3278.96            | 0.81              | 2.65               |
| 71                       | 1.25                      | 0.09                      | 1.55                       | 3153.69                    | 13.32                     | 14.87                      | 7.44              | 0.52              | 4.16               | 18701.30           | 78.99             | 88.15              |
| 83                       | 1.09                      | 0.12                      | 1.50                       | 3153.85                    | 16.23                     | 17.82                      | 7.67              | 0.85              | 11.20              | 22234.63           | 114.45            | 125.65             |
| 88                       | 1.09                      | 0.13                      | 1.67                       | 3153.93                    | 17.54                     | 19.20                      | 7.95              | 0.91              | 12.12              | 22928.32           | 127.49            | 139.62             |
| 6                        | 28.37                     | 6.79                      | 1.89                       | 3092.67                    | 1.81                      | 3.69                       | 28.71             | 6.87              | 1.91               | 3129.78            | 1.83              | 3.74               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 6                        | 43.491         | 3380.367         | -0.000          | 0.836          | 1.900            | 2.736            |
| 71                       | 0.738          | 1855.288         | 0.051           | 7.836          | 0.909            | 8.745            |
| 83                       | 0.659          | 1910.192         | 0.073           | 9.832          | 0.962            | 10.795           |
| 88                       | 0.538          | 1841.632         | 0.073           | 10.240         | 0.974            | 11.214           |
| 6                        | 30.226         | 3294.509         | 7.236           | 1.921          | 2.013            | 3.936            |

CAL ID NUMBER: 293 ENGINE TYPE AND MODEL: JT8D-1  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 648822

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 35.880                    | 971.287               | 1.000              | 19.00                   | 11.362             | 307.57               | 36.941                | 266.00            | 0.04271            |
| TAKEOFF                            | 1.000               | 14000.0       | 3.410                     | 8319.148              | 1.000              | 0.70                    | 0.040              | 97.06                | 0.410                 | 163.33            | 0.00024            |
| CLIMBOUT                           | 0.850               | 11900.0       | 6.047                     | 7014.898              | 1.000              | 2.20                    | 0.222              | 257.21               | 0.862                 | 436.33            | 0.00051            |
| APPROACH                           | 0.400               | 5600.0        | 17.430                    | 3354.598              | 1.000              | 4.00                    | 1.162              | 223.64               | 5.196                 | 373.33            | 0.00311            |
| TAXI-IDLE                          | 0.060               | 840.0         | 35.880                    | 971.287               | 1.000              | 7.00                    | 4.186              | 113.32               | 36.941                | 98.00             | 0.04271            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 16.971             | 998.80               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.992             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 12.694             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.284              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 6.613                     | 971.287               | 1.000              | 19.00                   | 2.094              | 307.57               | 6.809                 | 266.00            | 0.00787            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.245                     | 8319.148              | 1.000              | 0.70                    | 0.003              | 97.06                | 0.029                 | 163.33            | 0.00002            |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.581                     | 7014.898              | 1.000              | 2.20                    | 0.021              | 257.21               | 0.083                 | 436.33            | 0.00005            |
| APPROACH                           | 0.400               | 5600.0        | 1.796                     | 3354.598              | 1.000              | 4.00                    | 0.120              | 223.64               | 0.535                 | 373.33            | 0.00032            |
| TAXI-IDLE                          | 0.060               | 840.0         | 6.613                     | 971.287               | 1.000              | 7.00                    | 0.772              | 113.32               | 6.809                 | 98.00             | 0.00787            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.010              | 998.80               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.013              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.251              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.204              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.846                     | 971.287               | 1.000              | 19.00                   | 0.901               | 307.57               | 2.930                 | 266.00            | 0.00339            |
| TAKEOFF                            | 1.000               | 14000.0       | 187.627                   | 8319.148              | 1.000              | 0.70                    | 2.189               | 97.06                | 22.554                | 163.33            | 0.01340            |
| CLIMBOUT                           | 0.850               | 11900.0       | 128.154                   | 7014.898              | 1.000              | 2.20                    | 4.699               | 257.21               | 18.269                | 436.33            | 0.01077            |
| APPROACH                           | 0.400               | 5600.0        | 34.273                    | 3354.598              | 1.000              | 4.00                    | 2.285               | 223.64               | 10.217                | 373.33            | 0.00612            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.846                     | 971.287               | 1.000              | 7.00                    | 0.332               | 113.32               | 2.930                 | 98.00             | 0.00339            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.406              | 998.80               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.418              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.783               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 156.355             |                      |                       |                   |                    |

DATE: 7/15/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL TO NUMBER: 404 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 653428

RATED THRUST: 14000.

ENGINE TOTAL TIME: 12937. HRS

TIME SINCE HOT SECTION OVERHAUL: 8829. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 14420. HRS  
N2 COMPRESSOR OVERHAUL: 15057. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL W/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 65.30 FINISH 66.20

ATMOSPHERIC PRESSURE: START 29.77 FINISH 29.82

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0074

RELATIVE HUMIDITY: 55.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
EXHAUST GAS TEMPERATURE IN DEGREES C  
NEW SMOKELESS BURNERS

| CLOCK TIME | TEST MODE | POWER THPUS, LBS<br>OP SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|----------------------------|--------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 1436.00    | 1/ 0      | 10842.00                   | 77                       | 7436.00 10986.00                | 6329.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.73                               | -0.00                                 |
| 1453.00    | 2/ 1      | 12241.00                   | 87                       | 7760.00 11211.00                | 7236.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.85                               | -0.00                                 |
| 1457.00    | 3/ 2      | 13414.00                   | 95                       | 8040.00 11397.00                | 8054.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.95                               | -0.00                                 |
| 1716.00    | 4/ 3      | 1035.00                    | 7                        | 2972.00 7220.00                 | 1162.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 77                                | 440.00                              | 51.70                              | 24.00               | 2.45                          | 1.50                 | 91.00               | -0.00                    | 78.00                    | -0.00     | -0.00 | -0.00        |
| 87                                | 506.00                              | 55.20                              | 30.00               | 2.60                          | 1.50                 | 120.00              | -0.00                    | 125.00                   | -0.00     | -0.00 | -0.00        |
| 95                                | 528.00                              | 58.20                              | 30.00               | 2.75                          | 1.80                 | 142.00              | -0.00                    | 147.00                   | -0.00     | -0.00 | -0.00        |
| 7                                 | 359.00                              | 31.40                              | 50.00               | 0.55                          | 11.40                | 3.60                | -0.00                    | 4.00                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|
| 77                                | 2.29                               | 0.07                               | -0.00                               | 3152.09                             | 12.24                              | 13.18                               | 14.51                              | 0.45                               | -0.00                               | 19949.60                            | 77.46                              | 83.42                               |
| 87                                | 2.31                               | 0.07                               | -0.00                               | 3152.07                             | 15.21                              | 15.84                               | 16.75                              | 0.48                               | -0.00                               | 22808.39                            | 110.05                             | 114.63                              |
| 95                                | 2.19                               | 0.08                               | -0.00                               | 3152.25                             | 17.02                              | 17.62                               | 17.63                              | 0.61                               | -0.00                               | 25388.19                            | 137.05                             | 141.87                              |
| 7                                 | 18.06                              | 2.36                               | -0.00                               | 3121.05                             | 2.14                               | 2.37                                | 20.94                              | 2.74                               | -0.00                               | 3626.65                             | 2.48                               | 2.76                                |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K*TH-HR | CO<br>2<br>LB/1K*TH-HR | THC<br>LB/1K*TH-HR | NO<br>LB/1K*TH-HR | NO<br>2<br>LB/1K*TH-HR | NO<br>X<br>LB/1K*TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 77                                | 1.333             | 1910.029               | 0.041              | 7.145             | -0.000                 | 7.694                  |
| 87                                | 1.368             | 1863.278               | 0.039              | 8.990             | -0.000                 | 9.365                  |
| 95                                | 1.314             | 1892.663               | 0.045              | 10.217            | -0.000                 | 10.576                 |
| 7                                 | 20.274            | 3504.014               | 2.647              | 2.398             | -0.000                 | 2.664                  |

CAL ID NUMBER: 404 ENGINE TYPE AND MODEL: JT8D-1

SERIAL NUMBER: 653428

TEST ORGANIZATION: UNITED/EPA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 17.309                    | 924.629               | 1.000              | 19.00                   | 5.481              | 292.80               | 18.720                | 266.00            | 0.02061            |
| TAKEOFF                            | 1.000               | 14000.0       | 16.324                    | 8492.324              | 1.000              | 0.70                    | 0.190              | 99.08                | 1.922                 | 163.33            | 0.00117            |
| CLIMBOUT                           | 0.850               | 11900.0       | 15.427                    | 7125.680              | 1.000              | 2.20                    | 0.566              | 261.27               | 2.165                 | 436.33            | 0.00130            |
| APPROACH                           | 0.400               | 5600.0        | 16.054                    | 3302.655              | 1.000              | 4.00                    | 1.070              | 220.18               | 4.861                 | 373.33            | 0.00287            |
| TAXI-IDLE                          | 0.060               | 840.0         | 17.309                    | 924.629               | 1.000              | 7.00                    | 2.019              | 107.87               | 18.720                | 98.00             | 0.02061            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.327              | 981.20               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 9.506              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.976              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.360              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.950                     | 924.629               | 1.000              | 19.00                   | 0.934              | 292.80               | 3.190                 | 266.00            | 0.00351            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.394                     | 8492.324              | 1.000              | 0.70                    | 0.005              | 99.08                | 0.046                 | 163.33            | 0.00003            |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.507                     | 7125.680              | 1.000              | 2.20                    | 0.019              | 261.27               | 0.071                 | 436.33            | 0.00004            |
| APPROACH                           | 0.400               | 5600.0        | 0.842                     | 3302.655              | 1.000              | 4.00                    | 0.056              | 220.18               | 0.255                 | 373.33            | 0.00015            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.950                     | 924.629               | 1.000              | 7.00                    | 0.344              | 107.87               | 3.190                 | 98.00             | 0.00351            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 1.358              | 981.20               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 1.384              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.015              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.328              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 1.815                     | 924.629               | 1.000              | 19.00                   | 0.575               | 292.80               | 1.963                 | 266.00            | 0.00216            |
| TAKEOFF                            | 1.000               | 14000.0       | 160.015                   | 8492.324              | 1.000              | 0.70                    | 1.867               | 99.08                | 18.842                | 163.33            | 0.01143            |
| CLIMBOUT                           | 0.850               | 11900.0       | 107.678                   | 7125.680              | 1.000              | 2.20                    | 3.948               | 261.27               | 15.111                | 436.33            | 0.00905            |
| APPROACH                           | 0.400               | 5600.0        | 25.792                    | 3302.655              | 1.000              | 4.00                    | 1.719               | 220.18               | 7.809                 | 373.33            | 0.00461            |
| TAXI-IDLE                          | 0.060               | 840.0         | 1.815                     | 924.629               | 1.000              | 7.00                    | 0.212               | 107.87               | 1.963                 | 98.00             | 0.00216            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.321               | 981.20               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 8.481               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.224               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 133.346             |                      |                       |                   |                    |

DATE: 6/29/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 123 ENGINE TYPE AND MODEL: JT8D-7

SERIAL NUMBER: 649361

RATED THRUST: 14000.

ENGINE TOTAL TIME: 14869. HRS

TIME SINCE HOT SECTION OVERHAUL: 4064. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 12192. HRS

N2 COMPRESSOR OVERHAUL: 10281. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A

FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 59.90 FINISH 63.50

ATMOSPHERIC PRESSURE: START 29.94 FINISH 30.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0076

RELATIVE HUMIDITY: 69.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKELESS BURNERS

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | N1       | N2      | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|----------|---------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 835.00        | 1/ 0         | 11050.00                          | 78                       | 7395.00                | 11099.00 | 6321.00 | -0.00                             | -0.000000                     | -0.00       | 1.75                                         | -0.00                              |                                       |
| 840.00        | 2/ 1         | 12250.00                          | 87                       | 7670.00                | 11303.00 | 7086.00 | -0.00                             | -0.000000                     | -0.00       | 1.85                                         | -0.00                              |                                       |
| 845.00        | 3/ 2         | 13550.00                          | 96                       | 7996.00                | 11521.00 | 8013.00 | -0.00                             | -0.000000                     | -0.00       | 1.96                                         | -0.00                              |                                       |
| 1005.00       | 4/ 3         | 1050.00                           | 7                        | 2942.00                | 7224.00  | 1133.00 | -0.00                             | -0.000000                     | -0.00       | -0.00                                        | -0.00                              |                                       |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 78                                | 849.00                              | 52.40                              | 30.00               | 2.76                          | 0.60                 | 95.00               | -0.00                    | 100.00                   | -0.00     | -0.00 | -0.00        |
| 87                                | 906.00                              | 55.30                              | 20.00               | 2.60                          | 0.45                 | 102.50              | -0.00                    | 105.00                   | -0.00     | -0.00 | -0.00        |
| 96                                | 951.00                              | 58.80                              | 15.00               | 2.71                          | 0.60                 | 150.00              | -0.00                    | 154.70                   | -0.00     | -0.00 | -0.00        |
| 7                                 | 676.40                              | 31.50                              | 60.00               | 0.33                          | 16.50                | 2.50                | -0.00                    | 3.20                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HP | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 78                                | 2.66                               | 0.03                               | -0.00                               | 3151.67                             | 13.85                              | 14.58                               | 16.83                   | 0.19                    | -0.00                    | 19421.40                 | 87.54                   | 92.15                    |
| 87                                | 1.54                               | 0.02                               | -0.00                               | 3153.41                             | 13.00                              | 13.31                               | 10.94                   | 0.14                    | -0.00                    | 22345.05                 | 92.09                   | 94.34                    |
| 96                                | 1.11                               | 0.03                               | -0.00                               | 3154.07                             | 18.25                              | 18.82                               | 9.90                    | 0.20                    | -0.00                    | 25273.59                 | 146.24                  | 150.82                   |
| 7                                 | 35.69                              | 5.62                               | -0.00                               | 3084.39                             | 2.44                               | 3.13                                | 40.44                   | 6.37                    | -0.00                    | 3494.61                  | 2.77                    | 3.54                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K*TH-HR | CO<br>2<br>LB/1K*TH-HR | THC<br>LB/1K*TH-HR | NO<br>LB/1K*TH-HR | NO<br>2<br>LB/1K*TH-HR | NO<br>X<br>LB/1K*TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 78                                | 1.523             | 1802.842               | 0.017              | 7.922             | -0.000                 | 8.339                  |
| 87                                | 0.893             | 1824.096               | 0.012              | 7.518             | -0.000                 | 7.701                  |
| 96                                | 0.657             | 1865.210               | 0.015              | 10.793            | -0.000                 | 11.131                 |
| 7                                 | 38.513            | 3328.201               | 6.066              | 2.616             | -0.000                 | 3.374                  |

CAL ID NUMBER: 123 ENGINE TYPE AND MODEL: JT8D-7

SERIAL NUMBER: 649361

TEST ORGANIZATION: UNITED/EPA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 32.538                    | 890.156               | 1.000              | 19.00                   | 10.304             | 281.88               | 36.553                | 266.00            | 0.03874            |
| TAKEOFF                            | 1.000               | 14000.0       | 4.281                     | 8358.797              | 1.000              | 0.70                    | 0.050              | 97.52                | 0.512                 | 163.33            | 0.00031            |
| CLIMBOUT                           | 0.850               | 11900.0       | 12.632                    | 6931.738              | 1.000              | 2.20                    | 0.463              | 254.16               | 1.822                 | 436.33            | 0.00106            |
| APPROACH                           | 0.400               | 5600.0        | 31.202                    | 3394.577              | 1.000              | 4.00                    | 2.080              | 226.31               | 9.192                 | 373.33            | 0.00557            |
| TAXI-IDLE                          | 0.060               | 840.0         | 32.538                    | 890.156               | 1.000              | 7.00                    | 3.796              | 103.85               | 36.553                | 98.00             | 0.03874            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 16.693             | 963.72               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 17.321             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 12.485             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.357              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 5.982                     | 890.156               | 1.000              | 19.00                   | 1.894              | 281.88               | 6.720                 | 266.00            | 0.00712            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8358.797              | 1.000              | 0.70                    | 0.0                | 97.52                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.0                       | 6931.738              | 1.000              | 2.20                    | 0.0                | 254.16               | 0.0                   | 436.33            | 0.0                |
| APPROACH                           | 0.400               | 5600.0        | 0.712                     | 3394.577              | 1.000              | 4.00                    | 0.047              | 226.31               | 0.210                 | 373.33            | 0.00013            |
| TAXI-IDLE                          | 0.060               | 840.0         | 5.982                     | 890.156               | 1.000              | 7.00                    | 0.698              | 103.85               | 6.720                 | 98.00             | 0.00712            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.640              | 963.72               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.739              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.974              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.211                     | 890.156               | 1.000              | 19.00                   | 0.700               | 281.88               | 2.484                 | 266.00            | 0.00263            |
| TAKEOFF                            | 1.000               | 14000.0       | 163.301                   | 8358.797              | 1.000              | 0.70                    | 1.905               | 97.52                | 19.536                | 163.33            | 0.01166            |
| CLIMBOUT                           | 0.850               | 11900.0       | 110.775                   | 6931.738              | 1.000              | 2.20                    | 4.062               | 254.16               | 15.981                | 436.33            | 0.00931            |
| APPROACH                           | 0.400               | 5600.0        | 30.360                    | 3394.577              | 1.000              | 4.00                    | 2.024               | 226.31               | 8.944                 | 373.33            | 0.00542            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.211                     | 890.156               | 1.000              | 7.00                    | 0.258               | 103.85               | 2.484                 | 98.00             | 0.00263            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.949               | 963.72               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 9.286               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.693               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 136.084             |                      |                       |                   |                    |

DATE: 7/30/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 347 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 654133

RATED THRUST: 14000.

ENGINE TOTAL TIME: 9583. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 7003. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 29.45 FINISH 29.45

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0100

RELATIVE HUMIDITY: 54.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 137.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C CAL ESTIMATE:  
SAMPLE LINE TEMP. AVERAGED  
PROBE LOCATED 10" FROM TAILPIPE WITH RETROFIT

| CLOCK TIME | TEST MODE | THRUST, LBS<br>ON SHP | POWER PERCENT<br>RATED T.C. | ENGINE SPEED RPM |          | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|-----------------------|-----------------------------|------------------|----------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                       |                             | N1               | N2       |                          |                         |           |                                     |                           |                              |
| 1200.00    | 5/ 0      | 9910.00               | 70                          | 7380.00          | 11110.00 | 5740.00                  | -0.00                   | -0.000000 | -0.00                               | 1.66                      | -0.00                        |
| 1205.00    | 1/ 5      | 1000.00               | 7                           | 2890.00          | 7140.00  | 1045.00                  | -0.00                   | -0.000000 | -0.00                               | 1.05                      | -0.00                        |
| 1210.00    | 4/ 1      | 10860.00              | 77                          | 7570.00          | 11270.00 | 6380.00                  | -0.00                   | -0.000000 | -0.00                               | 1.75                      | -0.00                        |
| 1215.00    | 3/ 4      | 12000.00              | 85                          | 7840.00          | 11500.00 | 7120.00                  | -0.00                   | -0.000000 | -0.00                               | 1.85                      | -0.00                        |
| 1220.00    | 2/ 3      | 13300.00              | 94                          | 8150.00          | 11730.00 | 8060.00                  | -0.00                   | -0.000000 | -0.00                               | 1.96                      | -0.00                        |

| POWER PERCENT<br>RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                             |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 7                           | 685.00                     | 19.12                     | 76.20         | 0.53                 | 34.60          | 3.60          | 3.00            | 6.60            | -0.00     | -0.00 | -0.00        |
| 77                          | 930.00                     | 25.02                     | 13.80         | 2.15                 | 9.90           | 91.40         | 5.50            | 48.90           | -0.00     | -0.00 | -0.00        |
| 85                          | 970.00                     | 26.43                     | 14.80         | 2.34                 | 8.60           | 114.60        | 6.00            | 120.60          | -0.00     | -0.00 | -0.00        |
| 94                          | 1075.00                    | 27.97                     | 15.30         | 2.59                 | 6.90           | 142.90        | 8.00            | 150.90          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT<br>RATED T.O. | MASS FMI CO LB/FUEL | MASS FMI HC LB/FUEL | MASS FMI NO2 LB/FUEL | MASS FMI CO2 LB/FUEL | MASS FMI NO LB/FUEL | MASS FMI NOX LB/FUEL | MASS FMI CO LB/FUEL | MASS FMI HC LB/FUEL | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|-----------------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------------------|---------------------|--------------------|--------------------|-------------------|--------------------|
|                             |                     |                     |                      |                      |                     |                      |                     |                     |                    |                    |                   |                    |
| 7                           | 28.24               | 7.36                | 1.93                 | 1091.26              | 2.20                | 4.02                 | 29.56               | 7.69                | 1.91               | 3230.37            | 2.29              | 4.21               |
| 77                          | 1.29                | 0.53                | 3.84                 | 3152.41              | 14.32               | 15.16                | 8.22                | 3.38                | 5.38               | 20112.39           | 91.34             | 96.72              |
| 85                          | 1.18                | 0.42                | 0.85                 | 3152.87              | 16.14               | 16.99                | 8.43                | 3.01                | 6.02               | 22448.44           | 114.93            | 120.95             |
| 94                          | 1.07                | 0.31                | 1.02                 | 3153.37              | 18.17               | 19.21                | 8.67                | 2.47                | 8.21               | 25416.15           | 146.60            | 154.80             |

| POWER PERCENT<br>RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|-----------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                             |                |                  |                 |                |                  |                  |
| 7                           | 29.559         | 3230.367         | 7.687           | 2.294          | 1.912            | 4.205            |
| 77                          | 0.757          | 1851.970         | 0.311           | 8.411          | 0.495            | 8.906            |
| 85                          | 0.702          | 1870.703         | 0.251           | 9.578          | 0.501            | 10.079           |
| 94                          | 0.648          | 1910.989         | 0.196           | 11.022         | 0.617            | 11.639           |

CAL ID NUMBER: 347 ENGINE TYPE AND MODEL: JT8D-7  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 654133

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 26.479                    | 908.471               | 1.000              | 19.00                   | 8.385              | 287.68               | 29.146                | 266.00            | 0.03152            |
| TAKEOFF                            | 1.000               | 14000.0       | 6.853                     | 8547.906              | 1.000              | 0.70                    | 0.080              | 99.73                | 0.802                 | 163.33            | 0.00049            |
| CLIMBOUT                           | 0.850               | 11900.0       | 7.130                     | 7185.719              | 1.000              | 2.20                    | 0.261              | 263.48               | 0.992                 | 436.33            | 0.00060            |
| APPROACH                           | 0.400               | 5600.0        | 17.079                    | 3287.870              | 1.000              | 4.00                    | 1.139              | 219.19               | 5.194                 | 373.33            | 0.00305            |
| TAXI-IDLE                          | 0.060               | 840.0         | 26.479                    | 908.471               | 1.000              | 7.00                    | 3.089              | 105.99               | 29.146                | 98.00             | 0.03152            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.954             | 976.06               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.272             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.689              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.571              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 6.951                     | 908.471               | 1.000              | 19.00                   | 2.201              | 287.68               | 7.651                 | 266.00            | 0.00827            |
| TAKEOFF                            | 1.000               | 14000.0       | 1.882                     | 8547.906              | 1.000              | 0.70                    | 0.022              | 99.73                | 0.220                 | 163.33            | 0.00013            |
| CLIMBOUT                           | 0.850               | 11900.0       | 2.650                     | 7185.719              | 1.000              | 2.20                    | 0.097              | 263.48               | 0.369                 | 436.33            | 0.00022            |
| APPROACH                           | 0.400               | 5600.0        | 3.421                     | 3287.870              | 1.000              | 4.00                    | 0.228              | 219.19               | 1.041                 | 373.33            | 0.00061            |
| TAXI-IDLE                          | 0.060               | 840.0         | 6.951                     | 908.471               | 1.000              | 7.00                    | 0.811              | 105.99               | 7.651                 | 98.00             | 0.00827            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.359              | 976.06               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.442              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.512              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.568              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 3.260                     | 908.471               | 1.000              | 19.00                   | 1.032               | 287.68               | 3.588                 | 266.00            | 0.00388            |
| TAKEOFF                            | 1.000               | 14000.0       | 178.049                   | 8547.906              | 1.000              | 0.70                    | 2.077               | 99.73                | 20.830                | 163.33            | 0.01272            |
| CLIMBOUT                           | 0.850               | 11900.0       | 122.605                   | 7185.719              | 1.000              | 2.20                    | 4.496               | 263.48               | 17.062                | 436.33            | 0.01030            |
| APPROACH                           | 0.400               | 5600.0        | 32.072                    | 3287.870              | 1.000              | 4.00                    | 2.138               | 219.19               | 9.755                 | 373.33            | 0.00573            |
| TAXI-IDLE                          | 0.060               | 840.0         | 3.260                     | 908.471               | 1.000              | 7.00                    | 0.380               | 105.99               | 3.588                 | 98.00             | 0.00388            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.123              | 976.06               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.372              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.572               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 148.374             |                      |                       |                   |                    |

DATE: 8/ 2/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 348 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 654374

RATED THRUST: 14000.

ENGINE TOTAL TIME: 10486. HRS

TIME SINCE MDT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 29.30 FINISH -0.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0120

RELATIVE HUMIDITY: 53.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 135.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C CAL ESTIMATED SAMPLE LINE TEMP. AVERAGED WITH RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP OFGREL F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-----------------|-----------|------------------------------------|---------------------------|------------------------------|
| 135.00     | 4/ 0      | 990.00                   | 7                  | 0.0 7230.00      | 1065.00                  | -0.00           | -0.000000 | -0.00                              | 1.04                      | -0.00                        |
| 150.00     | 5/ 4      | 9600.00                  | 68                 | 7300.00 10830.00 | 5670.00                  | -0.00           | -0.000000 | -0.00                              | 1.65                      | -0.00                        |
| 155.00     | 4/ 5      | 920.00                   | 6                  | 2890.00 7115.00  | 1070.00                  | -0.00           | -0.000000 | -0.00                              | 1.04                      | -0.00                        |
| 205.00     | 1/ 4      | 10450.00                 | 77                 | 7560.00 11025.00 | 6460.00                  | -0.00           | -0.000000 | -0.00                              | 1.74                      | -0.00                        |
| 215.00     | 2/ 1      | 11750.00                 | 83                 | 7800.00 11270.00 | 7090.00                  | -0.00           | -0.000000 | -0.00                              | 1.84                      | -0.00                        |
| 270.00     | 3/ 2      | 12120.00                 | 86                 | 7880.00 11275.00 | 7310.00                  | -0.00           | -0.000000 | -0.00                              | 1.87                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 7                        | 700.00                     | 14.97                     | 38.50         | 0.77                 | 36.70          | 4.00          | 4.90            | 8.50            | -0.00     | -0.00 | -0.00        |
| 68                       | 895.00                     | 23.44                     | 19.50         | 2.22                 | 2.60           | 64.10         | 15.00           | 79.10           | -0.00     | -0.00 | -0.00        |
| 6                        | 695.00                     | 14.97                     | 96.00         | 0.73                 | 41.50          | 4.10          | 5.00            | 9.10            | -0.00     | -0.00 | -0.00        |
| 77                       | 945.00                     | 24.79                     | 19.50         | 2.52                 | 5.40           | 86.40         | 18.00           | 104.40          | -0.00     | -0.00 | -0.00        |
| 83                       | 970.00                     | 26.16                     | 19.00         | 2.72                 | 2.20           | 103.90        | 19.50           | 123.40          | -0.00     | -0.00 | -0.00        |
| 86                       | 980.00                     | 26.53                     | 19.00         | 2.40                 | 1.70           | 109.60        | 19.50           | 129.10          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOY LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 7                        | 22.72                     | 5.40                      | 1.90                       | 3105.39                    | 1.69                      | 3.58                       | 24.19             | 5.75              | 2.02               | 3307.24            | 1.80              | 3.82               |
| 68                       | 1.74                      | 0.13                      | 2.23                       | 3152.75                    | 9.52                      | 11.74                      | 9.99              | 0.76              | 12.63              | 17876.10           | 53.96             | 66.59              |
| 6                        | 25.93                     | 6.42                      | 2.22                       | 3097.54                    | 1.82                      | 4.04                       | 27.74             | 6.87              | 2.37               | 3314.37            | 1.95              | 4.32               |
| 77                       | 1.55                      | 0.25                      | 2.35                       | 3152.77                    | 11.30                     | 12.65                      | 10.03             | 1.59              | 15.21              | 20366.91           | 73.00             | 88.21              |
| 83                       | 1.40                      | 0.09                      | 2.36                       | 3153.43                    | 12.59                     | 14.96                      | 9.94              | 0.66              | 14.76              | 22357.82           | 89.28             | 106.04             |
| 86                       | 1.36                      | 0.07                      | 2.30                       | 3153.56                    | 12.90                     | 15.20                      | 9.96              | 0.51              | 16.78              | 23052.50           | 94.33             | 111.11             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 7                        | 24.437         | 3340.651         | 5.804           | 1.814          | 2.041            | 3.855            |
| 68                       | 1.041          | 1862.094         | 0.079           | 5.621          | 1.315            | 6.976            |
| 6                        | 10.152         | 3602.578         | 7.465           | 2.115          | 2.580            | 4.695            |
| 77                       | 0.924          | 1877.135         | 0.147           | 6.724          | 1.402            | 8.130            |
| 83                       | 0.846          | 1902.794         | 0.056           | 7.598          | 1.426            | 9.024            |
| 86                       | 0.821          | 1902.021         | 0.042           | 7.783          | 1.385            | 9.168            |

CAL ID NUMBER: 348 ENGINE TYPE AND MODEL: JT8D-7  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 654374

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 23.727                    | 966.152               | 1.000              | 19.00                   | 7.514              | 305.95               | 24.558                | 266.00            | 0.02825            |
| TAKEOFF                            | 1.000               | 14000.0       | 8.454                     | 8664.551              | 1.000              | 0.70                    | 0.099              | 101.09               | 0.976                 | 163.33            | 0.00060            |
| CLIMBOUT                           | 0.850               | 11900.0       | 8.558                     | 7293.980              | 1.000              | 2.20                    | 0.314              | 267.45               | 1.173                 | 436.33            | 0.00072            |
| APPROACH                           | 0.400               | 5600.0        | 16.453                    | 3208.673              | 1.000              | 4.00                    | 1.097              | 213.91               | 5.128                 | 373.33            | 0.00294            |
| TAXI-IDLE                          | 0.060               | 840.0         | 23.727                    | 966.152               | 1.000              | 7.00                    | 2.768              | 112.72               | 24.558                | 98.00             | 0.02825            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 11.791             | 1001.11              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 11.778             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.819              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.705              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 6.138                     | 966.152               | 1.000              | 19.00                   | 1.944              | 305.95               | 6.353                 | 266.00            | 0.00731            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8664.551              | 1.000              | 0.70                    | 0.0                | 101.09               | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.387                     | 7293.980              | 1.000              | 2.20                    | 0.014              | 267.45               | 0.053                 | 436.33            | 0.00003            |
| APPROACH                           | 0.400               | 5600.0        | 1.911                     | 3208.673              | 1.000              | 4.00                    | 0.127              | 213.91               | 0.596                 | 373.33            | 0.00034            |
| TAXI-IDLE                          | 0.060               | 840.0         | 6.138                     | 966.152               | 1.000              | 7.00                    | 0.716              | 112.72               | 6.353                 | 98.00             | 0.00731            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.801              | 1001.11              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.798              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.095              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 3.590                     | 966.152               | 1.000              | 19.00                   | 1.137               | 305.95               | 3.716                 | 266.00            | 0.00427            |
| TAKEOFF                            | 1.000               | 14000.0       | 166.816                   | 8664.551              | 1.000              | 0.70                    | 1.946               | 101.09               | 19.253                | 163.33            | 0.01192            |
| CLIMBOUT                           | 0.850               | 11900.0       | 111.933                   | 7293.980              | 1.000              | 2.20                    | 4.104               | 267.45               | 15.346                | 436.33            | 0.00941            |
| APPROACH                           | 0.400               | 5600.0        | 27.879                    | 3208.673              | 1.000              | 4.00                    | 1.859               | 213.91               | 8.689                 | 373.33            | 0.00498            |
| TAXI-IDLE                          | 0.060               | 840.0         | 3.590                     | 966.152               | 1.000              | 7.00                    | 0.419               | 112.72               | 3.716                 | 98.00             | 0.00427            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.465               | 1001.11              |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 9.454               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.079               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 139.013             |                      |                       |                   |                    |

DATE: 7/23/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 409 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 648770

RATED THRUST: 14000.

ENGINE TOTAL TIME: 15408. HRS

TIME SINCE HOT SECTION OVERHAUL: 15408. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 13921. HRS  
N2 COMPRESSOR OVERHAUL: 10927. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 60.80 FINISH 58.28

ATMOSPHERIC PRESSURE: START 29.90 FINISH 30.02

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0087

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
SMOKELESS REBUILT ENGINE.  
EPR OUT OF LIMITS (HIGH).

| CLOCK<br>TIME | TEST<br>MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |          | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|--------------------------|-----------------------------------|--------------------------|------------------------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                          |                                   |                          | N1                     | N2       |                                   |                               |             |                                              |                                    |                                       |
| 1001.00       | 1/ 0         | 10624.00                 | 75                                | 75                       | 7293.00                | 10753.00 | 6142.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.73                               | -0.00                                 |
| 1006.00       | 2/ 1         | 12004.00                 | 85                                | 85                       | 7664.00                | 10980.00 | 6998.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.84                               | -0.00                                 |
| 1010.00       | 3/ 2         | 13585.00                 | 97                                | 97                       | 7983.00                | 11237.00 | 8089.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.98                               | -0.00                                 |
| 1100.00       | 4/ 3         | 1010.00                  | 7                                 | 7                        | 2952.00                | 7143.00  | 1201.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 85                                | 914.00                              | 55.30                              | 45.00               | 2.50                          | 0.84                 | 95.00               | -0.00                    | 103.00                   | -0.00     | -0.00 | -0.00        |
| 97                                | 969.80                              | 59.30                              | 45.00               | 2.80                          | 0.90                 | 118.00              | -0.00                    | 128.00                   | -0.00     | -0.00 | -0.00        |
| 7                                 | 728.60                              | 31.70                              | 140.00              | 0.75                          | 68.50                | 7.60                | -0.00                    | 8.00                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 85                                | 3.61                               | 0.04                               | -0.00                               | 3150.11                             | 12.51                              | 13.57                               | 25.25                   | 0.27                    | -0.00                    | 22044.48                 | 87.57                   | 94.95                    |
| 97                                | 3.22                               | 0.04                               | -0.00                               | 3150.72                             | 13.88                              | 15.06                               | 26.07                   | 0.30                    | -0.00                    | 25488.20                 | 112.28                  | 121.80                   |
| 7                                 | 36.48                              | 10.22                              | -0.00                               | 3070.53                             | 3.25                               | 3.42                                | 43.81                   | 12.28                   | -0.00                    | 3687.70                  | 3.91                    | 4.11                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 85                                | 2.104             | 1836.428               | 0.022              | 7.295             | -0.000                 | 7.910                  |
| 97                                | 1.919             | 1876.054               | 0.022              | 8.265             | -0.000                 | 8.966                  |
| 7                                 | 43.377            | 3651.192               | 12.155             | 3.868             | -0.000                 | 4.071                  |

CAL ID NUMBER: 409 ENGINE TYPE AND MODEL: JT8D-7

SERIAL NUMBER: 648770

TEST ORGANIZATION: UNITED/EPA

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 33.699                    | 915.873               | 1.000              | 19.00                   | 10.671             | 290.03               | 36.795                | 266.00            | 0.04012            |
| TAKEOFF                            | 1.000               | 14000.0       | 23.861                    | 8263.066              | 1.000              | 0.70                    | 0.278              | 96.40                | 2.888                 | 163.33            | 0.00170            |
| CLIMBOUT                           | 0.850               | 11900.0       | 23.952                    | 6997.859              | 1.000              | 2.20                    | 0.878              | 256.59               | 3.423                 | 436.33            | 0.00201            |
| APPROACH                           | 0.400               | 5600.0        | 28.818                    | 3337.709              | 1.000              | 4.00                    | 1.921              | 222.51               | 8.634                 | 373.33            | 0.00515            |
| TAXI-IDLE                          | 0.060               | 840.0         | 33.699                    | 915.873               | 1.000              | 7.00                    | 3.932              | 106.85               | 36.795                | 98.00             | 0.04012            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 17.681             | 972.38               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 18.183             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 13.224             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.988              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 10.976                    | 915.873               | 1.000              | 19.00                   | 3.476              | 290.03               | 11.984                | 266.00            | 0.01307            |
| TAKEOFF                            | 1.000               | 14000.0       | 0.0                       | 8263.066              | 1.000              | 0.70                    | 0.0                | 96.40                | 0.0                   | 163.33            | 0.0                |
| CLIMBOUT                           | 0.850               | 11900.0       | 0.122                     | 6997.859              | 1.000              | 2.20                    | 0.004              | 256.59               | 0.018                 | 436.33            | 0.00001            |
| APPROACH                           | 0.400               | 5600.0        | 1.750                     | 3337.709              | 1.000              | 4.00                    | 0.117              | 222.51               | 0.524                 | 373.33            | 0.00031            |
| TAXI-IDLE                          | 0.060               | 840.0         | 10.976                    | 915.873               | 1.000              | 7.00                    | 1.280              | 106.85               | 11.984                | 98.00             | 0.01307            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 4.877              | 972.38               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.016              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.648              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 840.0         | 2.421                     | 915.873               | 1.000              | 19.00                   | 0.767               | 290.03               | 2.643                 | 266.00            | 0.00288            |
| TAKEOFF                            | 1.000               | 14000.0       | 130.025                   | 8263.066              | 1.000              | 0.70                    | 1.517               | 96.40                | 15.736                | 163.33            | 0.00929            |
| CLIMBOUT                           | 0.850               | 11900.0       | 94.019                    | 6997.859              | 1.000              | 2.20                    | 3.447               | 256.59               | 13.435                | 436.33            | 0.00790            |
| APPROACH                           | 0.400               | 5600.0        | 26.164                    | 3337.709              | 1.000              | 4.00                    | 1.744               | 222.51               | 7.839                 | 373.33            | 0.00467            |
| TAXI-IDLE                          | 0.060               | 840.0         | 2.421                     | 915.873               | 1.000              | 7.00                    | 0.282               | 106.85               | 2.643                 | 98.00             | 0.00288            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.758               | 972.38               |                       | 1337.00           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.978               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.802               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 108.354             |                      |                       |                   |                    |

DATE: 6/23/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 87 ENGINE TYPE AND MODEL: JT-80-95 SERIAL NUMBER: 665397

RATED THRUST: 14500.

ENGINE TOTAL TIME: 5469. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 86.00

ATMOSPHERIC PRESSURE: START 14.35 FINISH 14.33

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

H/C IS CAL-ESTIMATED  
SMOKELESS ENGINE

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1135.00    | 1/ 0      | 880.00             | 6                        | 2770.00          | 7060.00                  | 1000.00                 | -0.00    | -0.000000                           | 1.02                      | -0.00                        |
| 1150.00    | 2/ 1      | 10230.00           | 70                       | 7360.00          | 11040.00                 | 5820.00                 | -0.00    | -0.000000                           | 2.09                      | -0.00                        |
| 1215.00    | 3/ 2      | 10800.00           | 74                       | 7490.00          | 11160.00                 | 6200.00                 | -0.00    | -0.000000                           | 2.14                      | -0.00                        |
| 1225.00    | 4/ 3      | 11840.00           | 81                       | 7720.00          | 11310.00                 | 6880.00                 | -0.00    | -0.000000                           | 2.28                      | -0.00                        |
| 1235.00    | 5/ 4      | 13610.00           | 93                       | 8180.00          | 11620.00                 | 8190.00                 | -0.00    | -0.000000                           | 2.55                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 6                        | 765.00                     | 15.30                     | 177.00        | 1.02                 | 108.00         | 17.40         | 6.00            | 23.40           | 4.39      | -0.00 | -0.00        |
| 70                       | 950.00                     | 24.50                     | -0.00         | -0.00                | -0.00          | -0.00         | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 74                       | 965.00                     | 24.70                     | 19.00         | 2.41                 | 13.00          | 97.60         | 6.00            | 103.60          | -0.00     | -0.00 | -0.00        |
| 81                       | 1000.00                    | 25.90                     | 18.00         | 2.67                 | 14.70          | 121.00        | 8.00            | 129.00          | -0.00     | -0.00 | -0.00        |
| 93                       | 1060.00                    | 28.30                     | 16.00         | 2.93                 | 17.30          | 170.00        | 12.00           | 182.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 6                        | 26.34                     | 11.89                     | 1.90                       | 3081.87                    | 5.50                      | 7.39                       | 26.34             | 11.89             | 1.90               | 3081.87            | 5.50              | 7.39               |
| 70                       | 0.20                      | 0.12                      | 0.33                       | 3155.26                    | 0.33                      | 0.66                       | 1.17              | 0.67              | 1.92               | 18363.61           | 1.92              | 3.84               |
| 74                       | 1.50                      | 0.62                      | 0.82                       | 3151.84                    | 13.34                     | 14.16                      | 9.29              | 3.84              | 5.09               | 19541.38           | 82.73             | 87.82              |
| 81                       | 1.35                      | 0.63                      | 0.99                       | 3152.03                    | 14.93                     | 15.92                      | 9.30              | 4.35              | 6.79               | 21645.95           | 102.74            | 109.51             |
| 93                       | 1.10                      | 0.58                      | 1.35                       | 3152.31                    | 19.12                     | 20.47                      | 9.97              | 5.56              | 11.05              | 25817.38           | 156.59            | 167.65             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 6                        | 29.937         | 3592.121         | 13.516          | 6.245          | 2.154            | 8.399            |
| 70                       | 0.114          | 1795.074         | 0.065           | 0.188          | 0.375            | 0.375            |
| 74                       | 0.860          | 1809.387         | 0.356           | 7.660          | 0.471            | 8.131            |
| 81                       | 0.796          | 1831.584         | 0.368           | 8.677          | 0.574            | 9.251            |
| 93                       | 0.654          | 1896.942         | 0.408           | 11.506         | 0.812            | 12.318           |

CAL ID NUMBER: 87 ENGINE TYPE AND MODEL: JT-8D-95  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 665397

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 24.495                    | 975.771               | 1.000              | 19.00                   | 7.757              | 308.99               | 25.103                | 275.50            | 0.02815            |
| TAKEOFF   | 1.000               | 14500.0       | 6.635                     | 8812.832              | 1.000              | 0.70                    | 0.077              | 102.82               | 0.753                 | 169.17            | 0.00046            |
| CLIMBOUT  | 0.850               | 12325.0       | 8.388                     | 7305.855              | 1.000              | 2.20                    | 0.308              | 267.88               | 1.148                 | 451.92            | 0.00068            |
| APPROACH  | 0.400               | 5800.0        | 18.596                    | 3429.552              | 1.000              | 4.00                    | 1.240              | 228.64               | 5.422                 | 386.67            | 0.00321            |
| TAXI-IDLE | 0.060               | 870.0         | 24.495                    | 975.771               | 1.000              | 7.00                    | 2.858              | 113.84               | 25.103                | 101.50            | 0.02815            |

TOTAL FOR CYCLE: 12.239 1022.17 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 11.974  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.838  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.534

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 9.883                     | 975.771               | 1.000              | 19.00                   | 3.130              | 308.99               | 10.129                | 275.50            | 0.01136            |
| TAKEOFF   | 1.000               | 14500.0       | 4.717                     | 8812.832              | 1.000              | 0.70                    | 0.055              | 102.82               | 0.535                 | 169.17            | 0.00033            |
| CLIMBOUT  | 0.850               | 12325.0       | 4.513                     | 7305.855              | 1.000              | 2.20                    | 0.165              | 267.88               | 0.618                 | 451.92            | 0.00037            |
| APPROACH  | 0.400               | 5800.0        | 3.514                     | 3429.552              | 1.000              | 4.00                    | 0.234              | 228.64               | 1.025                 | 386.67            | 0.00061            |
| TAXI-IDLE | 0.060               | 870.0         | 9.883                     | 975.771               | 1.000              | 7.00                    | 1.153              | 113.84               | 10.129                | 101.50            | 0.01136            |

TOTAL FOR CYCLE: 4.738 1022.17 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.635  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 3.421  
LBS POLLUTANT/1000K LB TH AT T.O.: 3.795

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 6.869                     | 975.771               | 1.000              | 19.00                   | 2.175               | 308.99               | 7.039                 | 275.50            | 0.00790            |
| TAKEOFF   | 1.000               | 14500.0       | 207.454                   | 8812.832              | 1.000              | 0.70                    | 2.420               | 102.82               | 23.540                | 169.17            | 0.01431            |
| CLIMBOUT  | 0.850               | 12325.0       | 125.870                   | 7305.855              | 1.000              | 2.20                    | 4.615               | 267.88               | 17.229                | 451.92            | 0.01021            |
| APPROACH  | 0.400               | 5800.0        | 34.704                    | 3429.552              | 1.000              | 4.00                    | 2.314               | 228.64               | 10.119                | 386.67            | 0.00598            |
| TAXI-IDLE | 0.060               | 870.0         | 6.869                     | 975.771               | 1.000              | 7.00                    | 0.801               | 113.84               | 7.039                 | 101.50            | 0.00790            |

TOTAL FOR CYCLE: 12.326 1022.17 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 12.058  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.901  
LBS POLLUTANT/1000K LB TH AT T.O.: 166.917

DATE: 7/22/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 294 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: 665314

RATED THRUST: 14500.

ENGINE TOTAL TIME: 3385. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: 0. HRS  
 COMBUSTION CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.20 FINISH 29.20

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0168

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 130.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C IS-CAL ESTIMATED  
 ENGINE RETURNED TO TEST AFTER REPAIR  
 SAMPLE LINE TEMP. AVERAGED  
 WITH RETROFIT

| CLOCK TIME | TEST MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>T/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 220.00     | 4/ 0      | 950.00                            | 6                        | 2880.00                | 7180.00                           | 1147.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.04                                  |
| 240.00     | 5/ 4      | 10550.00                          | 72                       | 7430.00                | 11030.00                          | 6220.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.73                                  |
| 250.00     | 4/ 5      | 1070.00                           | 7                        | 2490.00                | 7350.00                           | 1090.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.04                                  |
| 255.00     | 1/ 4      | 10870.00                          | 74                       | 7500.00                | 11050.00                          | 6440.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.75                                  |
| 300.00     | 2/ 1      | 11890.00                          | 81                       | 7748.00                | 11255.00                          | 7130.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.86                                  |
| 305.00     | 3/ 2      | 13440.00                          | 92                       | 8150.00                | 11520.00                          | 8290.00                       | -0.00       | -0.000000                                    | -0.00                              | 2.02                                  |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 6                                 | 745.00                              | 14.88                              | 131.00              | 0.78                          | 56.20                | 2.90                | 4.00                     | 6.90                     | -0.00     | -0.00 | -0.00        |
| 72                                | 935.00                              | 24.40                              | 18.00               | 2.36                          | 7.20                 | 49.70               | 12.50                    | 102.20                   | 0.23      | -0.00 | -0.00        |
| 7                                 | 715.00                              | 14.88                              | 120.00              | 0.80                          | 58.30                | 3.40                | 5.00                     | 8.40                     | 4.98      | -0.00 | -0.00        |
| 74                                | 950.00                              | 24.80                              | 17.00               | 2.31                          | 1.70                 | 106.00              | 14.00                    | 120.00                   | 0.23      | -0.00 | -0.00        |
| 81                                | 975.00                              | 26.20                              | 16.50               | 2.46                          | 1.70                 | 117.20              | 14.00                    | 131.20                   | 0.24      | -0.00 | -0.00        |
| 92                                | 1030.00                             | 28.50                              | 16.00               | 2.72                          | 1.30                 | 157.20              | 16.00                    | 173.20                   | 0.39      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CU2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 6                                 | 32.94                              | 8.09                               | 1.65                                | 3081.92                             | 1.20                               | 2.85                                | 37.79                   | 9.28                    | 1.90                     | 3534.96                  | 1.37                    | 3.27                     |
| 72                                | 1.53                               | 0.11                               | 1.75                                | 3153.19                             | 12.53                              | 14.27                               | 9.52                    | 0.67                    | 10.86                    | 19612.85                 | 77.93                   | 88.79                    |
| 7                                 | 29.47                              | 8.20                               | 2.02                                | 3087.09                             | 1.37                               | 3.39                                | 32.12                   | 8.94                    | 2.20                     | 3364.92                  | 1.50                    | 3.69                     |
| 74                                | 1.48                               | 0.08                               | 2.00                                | 3153.34                             | 15.13                              | 17.12                               | 9.51                    | 0.54                    | 12.87                    | 20307.48                 | 97.42                   | 110.28                   |
| 81                                | 1.35                               | 0.08                               | 1.84                                | 3153.56                             | 15.71                              | 17.58                               | 9.60                    | 0.57                    | 13.38                    | 22484.84                 | 111.99                  | 125.36                   |
| 92                                | 1.18                               | 0.05                               | 1.94                                | 3153.88                             | 19.06                              | 20.99                               | 9.79                    | 0.46                    | 16.08                    | 26145.70                 | 157.97                  | 174.04                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 6                                 | 39.774            | 3721.014               | 9.773              | 1.446             | 1.995                  | 3.441                  |
| 72                                | 0.902             | 1859.038               | 0.063              | 7.387             | 1.029                  | 8.416                  |
| 7                                 | 30.022            | 3144.786               | 8.354              | 1.397             | 2.055                  | 3.452                  |
| 74                                | 0.875             | 1868.214               | 0.050              | 8.962             | 1.184                  | 10.146                 |
| 81                                | 0.807             | 1891.072               | 0.048              | 9.419             | 1.125                  | 10.544                 |
| 92                                | 0.728             | 1945.364               | 0.034              | 11.753            | 1.196                  | 12.950                 |

CAL ID NUMBER: 294 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 665314

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 31.159                    | 977.719               | 1.000              | 19.00                   | 9.867              | 309.61               | 31.869                | 275.50            | 0.03581            |
| TAKEOFF                            | 1.000               | 14500.0       | 9.124                     | 9143.723              | 1.000              | 0.70                    | 0.106              | 106.68               | 0.998                 | 169.17            | 0.00063            |
| CLIMBOUT                           | 0.850               | 12325.0       | 9.803                     | 7595.383              | 1.000              | 2.20                    | 0.359              | 278.50               | 1.291                 | 451.92            | 0.00080            |
| APPROACH                           | 0.400               | 5800.0        | 21.674                    | 3624.235              | 1.000              | 4.00                    | 1.445              | 241.62               | 5.980                 | 386.67            | 0.00374            |
| TAXI-IDLE                          | 0.060               | 870.0         | 31.159                    | 977.719               | 1.000              | 7.00                    | 3.635              | 114.07               | 31.869                | 101.50            | 0.03581            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.413             | 1050.47              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 14.673             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.131             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.734              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 8.384                     | 977.719               | 1.000              | 19.00                   | 2.655              | 309.61               | 8.575                 | 275.50            | 0.00964            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.0                       | 9143.723              | 1.000              | 0.70                    | 0.0                | 106.68               | 0.0                   | 169.17            | 0.0                |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.456                     | 7595.383              | 1.000              | 2.20                    | 0.017              | 278.50               | 0.060                 | 451.92            | 0.00004            |
| APPROACH                           | 0.400               | 5800.0        | 2.690                     | 3624.235              | 1.000              | 4.00                    | 0.179              | 241.62               | 0.742                 | 386.67            | 0.00046            |
| TAXI-IDLE                          | 0.060               | 870.0         | 8.384                     | 977.719               | 1.000              | 7.00                    | 0.978              | 114.07               | 8.575                 | 101.50            | 0.00964            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.829              | 1050.47              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.645              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.765              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.888                     | 977.719               | 1.000              | 19.00                   | 0.914               | 309.61               | 2.953                 | 275.50            | 0.00332            |
| TAKEOFF                            | 1.000               | 14500.0       | 222.620                   | 9143.723              | 1.000              | 0.70                    | 2.597               | 106.68               | 24.347                | 169.17            | 0.01535            |
| CLIMBOUT                           | 0.850               | 12325.0       | 140.248                   | 7595.383              | 1.000              | 2.20                    | 5.142               | 278.50               | 18.465                | 451.92            | 0.01138            |
| APPROACH                           | 0.400               | 5800.0        | 34.118                    | 3624.235              | 1.000              | 4.00                    | 2.275               | 241.62               | 9.414                 | 386.67            | 0.00588            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.888                     | 977.719               | 1.000              | 7.00                    | 0.337               | 114.07               | 2.953                 | 101.50            | 0.00332            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 11.265              | 1050.47              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.724              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.135               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 179.119             |                      |                       |                   |                    |

DATE: 7/27/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 349 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: 665401

RATED THRUST: 14500.

ENGINE TOTAL TIME: 5500. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 6681. HRS  
N2 TURBINE OVERHAUL: 7641. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 81.00

ATMOSPHERIC PRESSURE: START 29.30 FINISH 29.30

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0153

RELATIVE HUMIDITY: 67.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 135.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C CAL ESTIMATED SAMPLE LINE TEMP AVERAGED WITH RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SFC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1200.00    | 5/ 0      | 10900.00                 | 75                 | 7440.00          | 11145.00                 | 6210.00                 | -0.00    | -0.000000                           | -0.00                     | 1.75                         |
| 1210.00    | 4/ 5      | 990.00                   | 6                  | 2890.00          | 7180.00                  | 970.00                  | -0.00    | -0.000000                           | -0.00                     | 1.05                         |
| 1220.00    | 1/ 4      | 10900.00                 | 75                 | 7500.00          | 11160.00                 | 6220.00                 | -0.00    | -0.000000                           | -0.00                     | 1.76                         |
| 1230.00    | 2/ 1      | 12000.00                 | 82                 | 7730.00          | 11350.00                 | 6880.00                 | -0.00    | -0.000000                           | -0.00                     | 1.85                         |
| 1235.00    | 3/ 2      | 13720.00                 | 94                 | 8150.00          | 11620.00                 | 8110.00                 | -0.00    | -0.000000                           | -0.00                     | 2.02                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALCOHOL | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|---------|-------|--------------|
| 75                       | 930.00                     | 24.78                     | 19.20         | 2.33                 | 1.50           | 83.00         | 17.00           | 100.00          | 0.19    | -0.00 | -0.00        |
| 6                        | 690.00                     | 15.02                     | 107.00        | 0.77                 | 51.80          | 1.90          | 6.00            | 7.90            | 4.34    | -0.00 | -0.00        |
| 75                       | 935.00                     | 24.94                     | 19.60         | 2.39                 | 2.60           | 85.60         | 18.00           | 103.60          | 0.17    | -0.00 | -0.00        |
| 82                       | 970.00                     | 26.17                     | 19.40         | 2.57                 | 2.20           | 103.40        | 20.00           | 123.40          | 0.19    | -0.00 | -0.00        |
| 94                       | 1035.00                    | 28.53                     | 19.20         | 2.88                 | 2.20           | 149.30        | 21.00           | 170.30          | 0.27    | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 75                       | 1.65                      | 0.07                      | 2.40                       | 3153.09                    | 11.74                     | 14.15                      | 10.27             | 0.46              | 14.93              | 19580.67           | 72.92             | 87.85              |
| 6                        | 27.35                     | 7.58                      | 2.52                       | 3092.12                    | 0.80                      | 3.32                       | 26.53             | 7.35              | 2.44               | 2999.35            | 0.77              | 3.22               |
| 75                       | 1.65                      | 0.13                      | 2.48                       | 3152.96                    | 11.81                     | 14.29                      | 10.24             | 0.78              | 15.44              | 19611.41           | 73.43             | 88.87              |
| 82                       | 1.51                      | 0.10                      | 2.57                       | 3153.24                    | 13.26                     | 15.83                      | 10.42             | 0.68              | 17.65              | 21694.28           | 91.25             | 108.90             |
| 94                       | 1.34                      | 0.09                      | 2.40                       | 3153.55                    | 17.09                     | 19.49                      | 10.85             | 0.71              | 19.50              | 25575.25           | 138.60            | 158.10             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 75                       | 0.942          | 1796.392         | 0.042           | 6.690          | 1.370            | 8.060            |
| 6                        | 26.795         | 3029.651         | 7.429           | 0.782          | 2.468            | 3.249            |
| 75                       | 0.439          | 1799.212         | 0.071           | 6.737          | 1.417            | 8.153            |
| 82                       | 0.869          | 1807.857         | 0.056           | 7.604          | 1.471            | 9.075            |
| 94                       | 0.791          | 1864.085         | 0.052           | 10.102         | 1.421            | 11.523           |

FORM 100-100-1

FORM 100-100-1

CAL ID NUMBER: 349 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: 665401  
TEST ORGANIZATION: U.S. BUREAU OF MINES

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 25.624                    | 926.992               | 1.000              | 19.00                   | 8.114              | 293.55               | 27.642                | 275.50            | 0.02945            |
| TAKEOFF                            | 1.000               | 14500.0       | 9.533                     | 8704.117              | 1.000              | 0.70                    | 0.111              | 101.55               | 1.095                 | 169.17            | 0.00066            |
| CLIMBOUT                           | 0.850               | 12325.0       | 9.460                     | 7330.152              | 1.000              | 2.20                    | 0.347              | 268.77               | 1.291                 | 451.92            | 0.00077            |
| APPROACH                           | 0.400               | 5800.0        | 13.590                    | 3208.258              | 1.000              | 4.00                    | 0.906              | 213.88               | 4.236                 | 386.67            | 0.00234            |
| TAXI-IDLE                          | 0.060               | 870.0         | 25.624                    | 926.992               | 1.000              | 7.00                    | 2.989              | 108.15               | 27.642                | 101.50            | 0.02945            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.468             | 985.90               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 12.646             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.004              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.767              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 7.310                     | 926.992               | 1.000              | 19.00                   | 2.315              | 293.55               | 7.886                 | 275.50            | 0.00840            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.339                     | 8704.117              | 1.000              | 0.70                    | 0.004              | 101.55               | 0.039                 | 169.17            | 0.00002            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.459                     | 7330.152              | 1.000              | 2.20                    | 0.017              | 268.77               | 0.063                 | 451.92            | 0.00004            |
| APPROACH                           | 0.400               | 5800.0        | 2.109                     | 3208.258              | 1.000              | 4.00                    | 0.141              | 213.88               | 0.657                 | 386.67            | 0.00036            |
| TAXI-IDLE                          | 0.060               | 870.0         | 7.310                     | 926.992               | 1.000              | 7.00                    | 0.853              | 108.15               | 7.886                 | 101.50            | 0.00840            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.329              | 985.90               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.377              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.404              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.273              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.786                     | 926.992               | 1.000              | 19.00                   | 0.882               | 293.55               | 3.006                 | 275.50            | 0.00320            |
| TAKEOFF                            | 1.000               | 14500.0       | 183.927                   | 8704.117              | 1.000              | 0.70                    | 2.146               | 101.55               | 21.131                | 169.17            | 0.01268            |
| CLIMBOUT                           | 0.850               | 12325.0       | 122.037                   | 7330.152              | 1.000              | 2.20                    | 4.475               | 268.77               | 16.649                | 451.92            | 0.00990            |
| APPROACH                           | 0.400               | 5800.0        | 31.081                    | 3208.258              | 1.000              | 4.00                    | 2.072               | 213.88               | 9.688                 | 386.67            | 0.00536            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.786                     | 926.992               | 1.000              | 7.00                    | 0.325               | 108.15               | 3.006                 | 101.50            | 0.00320            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.900               | 985.90               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.042              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.149               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 147.987             |                      |                       |                   |                    |

DATE: 7/26/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 350 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: 665166

RATED THRUST: 14500.

ENGINE TOTAL TIME: 7361. HRS

TIME SINCE HOT SECTION OVERHAUL: 1986. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 2853. HRS  
 N2 COMPRESSOR OVERHAUL: 3894. HRS  
 COMBUSTOR CAN REPLACEMENT: 1986. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 1986. HRS  
 N1 TURBINE OVERHAUL: 5001. HRS  
 N2 TURBINE OVERHAUL: 5372. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 29.30 FINISH 29.30

INLET AIR HUMIDITY, LBS H<sub>2</sub>O/LB AIR: 0.0130

RELATIVE HUMIDITY: 76.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 139.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C CAL ESTIMATED SAMPLE LINE TEMP. AVERAGED WITH RETROFIT FIRST IDLE MODE UNTRIMMED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM |          | MEASURED FUEL FLOW LB/HR | GAS FLOW AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO FPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|----------|--------------------------|--------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                          |                    | N1               | N2       |                          |                          |           |                                     |                           |                              |
| 125.00     | 4/ 0      | 960.00                   | 6                  | 2860.00          | 6950.00  | 1110.00                  | -0.00                    | -0.000000 | -0.00                               | 1.04                      | -0.00                        |
| 135.00     | 5/ 4      | 10400.00                 | 71                 | 7360.00          | 11000.00 | 6100.00                  | -0.00                    | -0.000000 | -0.00                               | 1.72                      | -0.00                        |
| 140.00     | 4/ 5      | 10200.00                 | 7                  | 2900.00          | 7060.00  | 1040.00                  | -0.00                    | -0.000000 | -0.00                               | 1.04                      | -0.00                        |
| 150.00     | 1/ 4      | 10900.00                 | 75                 | 7430.00          | 10900.00 | 6330.00                  | 288.00                   | -0.000000 | -0.00                               | 1.76                      | -0.00                        |
| 155.00     | 7/ 1      | 12000.00                 | 82                 | 7670.00          | 11130.00 | 6960.00                  | 300.00                   | -0.000000 | -0.00                               | 1.85                      | -0.00                        |
| 200.00     | 3/ 2      | 13700.00                 | 94                 | 8110.00          | 11410.00 | 8210.00                  | 314.00                   | -0.000000 | -0.00                               | 2.03                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 71                       | 935.00                     | 24.40                     | 23.00         | 2.42                 | 3.90           | 82.10         | 16.00           | 98.10           | 0.25      | -0.00 | -0.00        |
| 7                        | 725.00                     | 14.99                     | 158.00        | 0.82                 | 90.70          | 7.30          | 7.50            | 14.80           | 7.14      | -0.00 | -0.00        |
| 75                       | 935.00                     | 25.04                     | 22.50         | 2.44                 | 2.40           | 43.30         | 19.00           | 62.30           | 0.23      | -0.00 | -0.00        |
| 82                       | 960.00                     | 24.35                     | 20.50         | 2.62                 | 2.20           | 69.30         | 19.00           | 88.30           | 0.24      | -0.00 | -0.00        |
| 94                       | 1020.00                    | 28.70                     | 19.50         | 2.93                 | 2.20           | 70.00         | 21.00           | 91.00           | 0.36      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO <sub>2</sub> LB/1K LB FUEL | MASS EMI CO <sub>2</sub> LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO <sub>2</sub> LB/HR | MASS EMI CO <sub>2</sub> LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------------------|----------------------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------------------|--------------------------------|-------------------|--------------------|
|                          |                           |                           |                                        |                                        |                           |                            |                   |                   |                                |                                |                   |                    |
| 71                       | 1.91                      | 0.19                      | 2.18                                   | 3152.39                                | 11.18                     | 13.36                      | 11.63             | 1.13              | 13.29                          | 19229.55                       | 68.20             | 81.49              |
| 7                        | 37.56                     | 12.35                     | 2.93                                   | 3062.99                                | 2.85                      | 5.78                       | 39.06             | 12.84             | 3.05                           | 3185.51                        | 2.96              | 6.01               |
| 75                       | 1.85                      | 0.11                      | 2.57                                   | 3152.67                                | 5.85                      | 8.42                       | 11.71             | 0.72              | 16.25                          | 19956.41                       | 37.02             | 53.27              |
| 82                       | 1.57                      | 0.10                      | 2.39                                   | 3153.16                                | 8.72                      | 11.11                      | 10.93             | 0.67              | 16.64                          | 21945.97                       | 60.68             | 77.32              |
| 94                       | 1.74                      | 0.09                      | 2.36                                   | 3153.55                                | 7.88                      | 10.24                      | 10.97             | 0.71              | 19.40                          | 25890.67                       | 64.66             | 84.06              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                          |                |                  |                 |                |                  |                  |
| 71                       | 1.118          | 1848.996         | 0.199           | 6.558          | 1.278            | 7.836            |
| 7                        | 38.299         | 3123.049         | 12.592          | 2.906          | 2.986            | 5.893            |
| 75                       | 1.075          | 1830.863         | 0.066           | 3.397          | 1.490            | 4.887            |
| 82                       | 0.911          | 1878.831         | 0.056           | 5.057          | 1.386            | 6.443            |
| 94                       | 0.800          | 1889.830         | 0.052           | 4.720          | 1.416            | 6.136            |

CAL ID NUMBER: 350 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 665166

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 33.870                    | 924.888               | 1.000              | 19.00                   | 10.726             | 292.88               | 36.621                | 275.50            | 0.03893            |
| TAKEOFF                            | 1.000               | 14500.0       | 7.052                     | 8801.363              | 1.000              | 0.70                    | 0.082              | 102.68               | 0.801                 | 169.17            | 0.00049            |
| CLIMBOUT                           | 0.850               | 12325.0       | 9.806                     | 7399.922              | 1.000              | 2.20                    | 0.360              | 271.33               | 1.325                 | 451.92            | 0.00080            |
| APPROACH                           | 0.400               | 5800.0        | 19.023                    | 3254.844              | 1.000              | 4.00                    | 1.268              | 216.99               | 5.845                 | 386.67            | 0.00328            |
| TAXI-IDLE                          | 0.060               | 870.0         | 33.870                    | 924.888               | 1.000              | 7.00                    | 3.952              | 107.90               | 36.621                | 101.50            | 0.03893            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 16.387             | 991.79               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.523             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.834             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.567              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 12.377                    | 924.888               | 1.000              | 19.00                   | 3.919              | 292.88               | 13.382                | 275.50            | 0.01423            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.187                     | 8801.363              | 1.000              | 0.70                    | 0.002              | 102.68               | 0.021                 | 169.17            | 0.00001            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.964                     | 7399.922              | 1.000              | 2.20                    | 0.035              | 271.33               | 0.130                 | 451.92            | 0.00008            |
| APPROACH                           | 0.400               | 5800.0        | 3.592                     | 3254.844              | 1.000              | 4.00                    | 0.239              | 216.99               | 1.103                 | 386.67            | 0.00062            |
| TAXI-IDLE                          | 0.060               | 870.0         | 12.377                    | 924.888               | 1.000              | 7.00                    | 1.444              | 107.90               | 13.382                | 101.50            | 0.01423            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 5.640              | 991.79               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.687              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 4.073              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.151              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.642                     | 924.888               | 1.000              | 19.00                   | 0.836               | 292.88               | 2.856                 | 275.50            | 0.00304            |
| TAKEOFF                            | 1.000               | 14500.0       | 123.275                   | 8801.363              | 1.000              | 0.70                    | 1.438               | 102.68               | 14.006                | 169.17            | 0.00850            |
| CLIMBOUT                           | 0.850               | 12325.0       | 85.889                    | 7399.922              | 1.000              | 2.20                    | 3.149               | 271.33               | 11.607                | 451.92            | 0.00697            |
| APPROACH                           | 0.400               | 5800.0        | 22.374                    | 3254.844              | 1.000              | 4.00                    | 1.492               | 216.99               | 6.874                 | 386.67            | 0.00386            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.642                     | 924.888               | 1.000              | 7.00                    | 0.308               | 107.90               | 2.856                 | 101.50            | 0.00304            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.224               | 991.79               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.284               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 5.217               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 99.187              |                      |                       |                   |                    |

DATE: 7/28/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 351 ENGINE TYPE AND MODEL: JT-8D-9

SERIAL NUMBER: 665359

RATED THRUST: 14500.

ENGINE TOTAL TIME: 6077. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 6077. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 6077. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A

FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 81.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START 29.29 FINISH 29.29

INLET AIR HUMIDITY, LBS H2O/LR AIR: 0.0180

RELATIVE HUMIDITY: 76.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 143.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C CAL ESTIMATED SAMPLE LINE TEMP. AVERAGED USED O-ARMED PROBE APPROX. 6 INCHES FROM TAILPIPE. WITH RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2 | MEASURED FUEL FLOW LR/HR | GAS GEN AIR FLOW LR/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|----------|----|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 610.00     | 5/ 0      | 10750.00                 | 74                 | 7450.00          | 11040.00 |    | 6220.00                  | -0.00                   | -0.000000 | -0.00                               | 1.74                      | -0.00                        |
| 620.00     | 4/ 5      | 10000.00                 | 6                  | 2900.00          | 7200.00  |    | 1020.00                  | -0.00                   | -0.000000 | -0.00                               | 1.03                      | -0.00                        |
| 625.00     | 1/ 4      | 10900.00                 | 75                 | 7480.00          | 11040.00 |    | 6340.00                  | -0.00                   | -0.000000 | -0.00                               | 1.76                      | -0.00                        |
| 630.00     | 2/ 1      | 12000.00                 | 82                 | 7730.00          | 11260.00 |    | 6970.00                  | -0.00                   | -0.000000 | -0.00                               | 1.87                      | -0.00                        |
| 630.00     | 3/ 2      | 11500.00                 | 93                 | 8130.00          | 11510.00 |    | 8110.00                  | -0.00                   | -0.000000 | -0.00                               | 2.00                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 74                       | 950.00                     | 24.68                     | 19.00         | 2.24                 | 2.40           | 84.20         | 7.50            | 91.70           | -0.00     | -0.00 | -0.00        |
| 6                        | 700.00                     | 14.87                     | 105.00        | 0.85                 | 33.70          | 1.30          | 4.50            | 7.80            | -0.00     | -0.00 | -0.00        |
| 75                       | 955.00                     | 24.90                     | 17.50         | 2.26                 | 2.60           | 87.80         | 8.50            | 96.30           | -0.00     | -0.00 | -0.00        |
| 82                       | 990.00                     | 26.43                     | 16.50         | 2.34                 | 2.40           | 108.60        | 9.50            | 118.10          | -0.00     | -0.00 | -0.00        |
| 93                       | 1100.00                    | 28.38                     | 16.00         | 2.57                 | 2.40           | 142.40        | 10.00           | 152.40          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LR/1K LR FUEL | MASS FMI HC LR/1K LR FUEL | MASS FMI NO2 LR/1K LR FUEL | MASS FMI CO2 LR/1K LR FUEL | MASS FMI N7 LR/1K LR FUEL | MASS FMI NOX LR/1K LR FUEL | MASS FMI CO LR/1K LR/HR | MASS FMI HC LR/1K LR/HR | MASS FMI NO2 LR/1K LR/HR | MASS FMI CO2 LR/1K LR/HR | MASS FMI NO LR/1K LR/HR | MASS FMI NOX LR/1K LR/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 74                       | 1.70                      | 0.12                      | 1.10                       | 3152.88                    | 12.39                     | 13.49                      | 10.59                   | 0.77                    | 6.86                     | 19610.89                 | 77.06                   | 83.93                    |
| 6                        | 24.41                     | 4.49                      | 1.72                       | 3105.22                    | 1.26                      | 2.98                       | 24.90                   | 4.58                    | 1.75                     | 3167.32                  | 1.29                    | 3.04                     |
| 75                       | 1.55                      | 0.13                      | 1.24                       | 3153.08                    | 12.81                     | 14.05                      | 9.85                    | 0.84                    | 7.86                     | 19990.55                 | 81.19                   | 89.05                    |
| 82                       | 1.42                      | 0.12                      | 1.34                       | 3153.34                    | 15.30                     | 16.64                      | 9.86                    | 0.82                    | 9.33                     | 21978.79                 | 106.64                  | 115.96                   |
| 93                       | 1.25                      | 0.11                      | 1.28                       | 3153.63                    | 18.27                     | 19.55                      | 10.13                   | 0.87                    | 10.40                    | 25575.96                 | 148.15                  | 158.55                   |

| POWER PERCENT RATED T.O. | CO LR/1K#TH-HR | CO 2 LR/1K#TH-HR | THC LR/1K#TH-HR | NO LR/1K#TH-HR | NO 2 LR/1K#TH-HR | NO X LR/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 74                       | 0.985          | 1824.269         | 0.071           | 7.169          | 0.639            | 7.807            |
| 6                        | 24.901         | 3167.322         | 4.577           | 1.285          | 1.753            | 3.038            |
| 75                       | 0.904          | 1833.996         | 0.077           | 7.448          | 0.721            | 8.170            |
| 82                       | 0.822          | 1831.566         | 0.068           | 8.886          | 0.777            | 9.664            |
| 93                       | 0.746          | 1893.355         | 0.064           | 10.909         | 0.766            | 11.675           |

CAL ID NUMBER: 351 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 665359

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 22.924                    | 928.453               | 1.000              | 19.00                   | 7.259              | 294.01               | 24.691                | 275.50            | 0.02635            |
| TAKEOFF   | 1.000               | 14500.0       | 9.152                     | 8717.707              | 1.000              | 0.70                    | 0.107              | 101.71               | 1.050                 | 169.17            | 0.00063            |
| CLIMBOUT  | 0.850               | 12325.0       | 9.858                     | 7391.855              | 1.000              | 2.20                    | 0.361              | 271.03               | 1.334                 | 451.92            | 0.00080            |
| APPROACH  | 0.400               | 5800.0        | 17.288                    | 3508.787              | 1.000              | 4.00                    | 1.153              | 233.92               | 4.927                 | 386.67            | 0.00298            |
| TAXI-IDLE | 0.060               | 870.0         | 22.924                    | 928.453               | 1.000              | 7.00                    | 2.674              | 108.32               | 24.691                | 101.50            | 0.02635            |

TOTAL FOR CYCLE: 11.554 1008.99 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 11.452  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.344  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.736

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 4.090                     | 928.453               | 1.000              | 19.00                   | 1.295              | 294.01               | 4.405                 | 275.50            | 0.00470            |
| TAKEOFF   | 1.000               | 14500.0       | 0.566                     | 8717.707              | 1.000              | 0.70                    | 0.007              | 101.71               | 0.065                 | 169.17            | 0.00004            |
| CLIMBOUT  | 0.850               | 12325.0       | 0.761                     | 7391.855              | 1.000              | 2.20                    | 0.028              | 271.03               | 0.103                 | 451.92            | 0.00006            |
| APPROACH  | 0.400               | 5800.0        | 1.454                     | 3508.787              | 1.000              | 4.00                    | 0.097              | 233.92               | 0.414                 | 386.67            | 0.00025            |
| TAXI-IDLE | 0.060               | 870.0         | 4.090                     | 928.453               | 1.000              | 7.00                    | 0.477              | 108.32               | 4.405                 | 101.50            | 0.00470            |

TOTAL FOR CYCLE: 1.904 1008.99 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 1.887  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.375  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.456

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 2.611                     | 928.453               | 1.000              | 19.00                   | 0.827               | 294.01               | 2.812                 | 275.50            | 0.00300            |
| TAKEOFF   | 1.000               | 14500.0       | 191.204                   | 8717.707              | 1.000              | 0.70                    | 2.231               | 101.71               | 21.933                | 169.17            | 0.01319            |
| CLIMBOUT  | 0.850               | 12325.0       | 125.976                   | 7391.855              | 1.000              | 2.20                    | 4.619               | 271.03               | 17.043                | 451.92            | 0.01022            |
| APPROACH  | 0.400               | 5800.0        | 25.844                    | 3508.787              | 1.000              | 4.00                    | 1.723               | 233.92               | 7.366                 | 386.67            | 0.00446            |
| TAXI-IDLE | 0.060               | 870.0         | 2.611                     | 928.453               | 1.000              | 7.00                    | 0.305               | 108.32               | 2.812                 | 101.50            | 0.00300            |

TOTAL FOR CYCLE: 9.704 1008.99 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 9.618  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.008  
LBS POLLUTANT/1000K LB TH AT T.O.: 153.842

DATE: 7/20/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 352 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: P-665709

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL W/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 29.79 FINISH 29.79

INLET AIR HUMIDITY, LBS H2O/LA AIR: -0.0000

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1141.00    | 1/ 0      | 5000.00            | 34                       | 5710.00                | 9790.00                  | 2843.00                 | 0.009500 | -0.00                               | 1.30                      | -0.00                        |
| 1243.00    | 4/ 1      | 9450.00            | 65                       | 7090.00                | 10810.00                 | 5250.00                 | 0.012100 | -0.00                               | 1.63                      | -0.00                        |
| 1258.00    | 5/ 4      | 10770.00           | 74                       | 7395.00                | 11030.00                 | 6035.00                 | 0.013000 | -0.00                               | 1.74                      | -0.00                        |
| 1311.00    | 6/ 5      | 11850.00           | 81                       | 7655.00                | 11205.00                 | 6675.00                 | 0.013600 | -0.00                               | 1.84                      | -0.00                        |
| 1328.00    | 7/ 6      | 13600.00           | 93                       | 8125.00                | 11525.00                 | 8000.00                 | 0.014800 | -0.00                               | 2.02                      | -0.00                        |
| 1350.00    | 8/ 7      | 780.00             | 5                        | 2530.00                | 6530.00                  | 908.00                  | 0.008800 | -0.00                               | 1.04                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 34                       | 695.00                     | 38.32                     | 47.10         | 1.42                 | 4.80           | 29.80         | 9.90            | 39.70           | -0.00     | 16.00 | -0.00        |
| 65                       | 835.00                     | 47.98                     | 17.50         | 2.10                 | 3.60           | 78.60         | 10.80           | 89.40           | -0.00     | 24.00 | -0.00        |
| 74                       | 885.00                     | 51.16                     | 14.60         | 2.23                 | 0.50           | 98.20         | 9.80            | 108.00          | -0.00     | 25.00 | 13.00        |
| 81                       | 915.00                     | 53.97                     | 12.60         | 2.46                 | 1.30           | 120.50        | 9.10            | 129.60          | -0.00     | 26.00 | 13.00        |
| 93                       | 985.00                     | 58.84                     | 10.60         | 2.68                 | 2.00           | 168.30        | 10.80           | 179.10          | -0.00     | 27.00 | 14.00        |
| 5                        | 710.00                     | 30.89                     | 197.20        | 1.00                 | 64.50          | 5.10          | 6.70            | 11.80           | -0.00     | 2.00  | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOY LB/1K LB FUEL | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|
| 34                       | 6.60                      | 0.39                      | 2.28                       | 3176.32                    | 6.86                      | 9.14                       | 12.76                     | 1.10                      | 6.48                       | 8888.12                    | 19.50                     | 25.98                      |
| 65                       | 1.66                      | 0.20                      | 1.69                       | 3134.60                    | 12.26                     | 13.95                      | 8.73                      | 1.03                      | 8.85                       | 16456.63                   | 64.39                     | 73.24                      |
| 74                       | 1.31                      | 0.03                      | 1.44                       | 3135.62                    | 14.43                     | 15.88                      | 7.89                      | 0.15                      | 8.69                       | 18921.48                   | 87.11                     | 95.81                      |
| 81                       | 1.02                      | 0.06                      | 1.21                       | 3135.97                    | 16.06                     | 17.27                      | 6.82                      | 0.40                      | 8.09                       | 20932.61                   | 107.19                    | 115.29                     |
| 93                       | 0.79                      | 0.09                      | 1.32                       | 3136.27                    | 20.59                     | 21.91                      | 6.32                      | 0.68                      | 10.57                      | 25090.16                   | 164.72                    | 175.29                     |
| 5                        | 38.38                     | 7.19                      | 2.14                       | 3057.73                    | 1.63                      | 3.77                       | 34.85                     | 6.53                      | 1.94                       | 2776.42                    | 1.48                      | 3.42                       |

| POWER PERCENT RATED T.O. | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 34                       | 3.753          | 1777.625         | 0.219           | 3.900          | 1.296            | 5.195            |
| 65                       | 0.924          | 1741.442         | 0.109           | 6.814          | 0.936            | 7.750            |
| 74                       | 0.732          | 1757.055         | 0.014           | 8.089          | 0.807            | 8.896            |
| 81                       | 0.576          | 1764.465         | 0.034           | 9.046          | 0.683            | 9.729            |
| 93                       | 0.464          | 1844.865         | 0.050           | 12.111         | 0.777            | 12.889           |
| 5                        | 44.474         | 3559.506         | 8.369           | 1.898          | 2.493            | 4.391            |

CAL ID NUMBER: 352 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-665709

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 31.939                    | 980.839               | 1.000              | 19.00                   | 10.114             | 310.60               | 32.563                | 275.50            | 0.03671            |
| TAKEOFF                            | 1.000               | 14500.0       | 2.953                     | 8565.398              | 1.000              | 0.70                    | 0.034              | 99.93                | 0.345                 | 169.17            | 0.00020            |
| CLIMBOUT                           | 0.850               | 12325.0       | 5.316                     | 7193.688              | 1.000              | 2.20                    | 0.195              | 263.77               | 0.739                 | 451.92            | 0.00043            |
| APPROACH                           | 0.400               | 5800.0        | 15.963                    | 3251.086              | 1.000              | 4.00                    | 1.064              | 216.74               | 4.910                 | 386.67            | 0.00275            |
| TAXI-IDLE                          | 0.060               | 870.0         | 31.939                    | 980.839               | 1.000              | 7.00                    | 3.726              | 114.43               | 32.563                | 101.50            | 0.03671            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.134             | 1005.47              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.051             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 10.929             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.238              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 5.838                     | 980.839               | 1.000              | 19.00                   | 1.849              | 310.60               | 5.952                 | 275.50            | 0.00671            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.463                     | 8565.398              | 1.000              | 0.70                    | 0.005              | 99.93                | 0.054                 | 169.17            | 0.00003            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.624                     | 7193.688              | 1.000              | 2.20                    | 0.023              | 263.77               | 0.087                 | 451.92            | 0.00005            |
| APPROACH                           | 0.400               | 5800.0        | 1.095                     | 3251.086              | 1.000              | 4.00                    | 0.073              | 216.74               | 0.337                 | 386.67            | 0.00019            |
| TAXI-IDLE                          | 0.060               | 870.0         | 5.838                     | 980.839               | 1.000              | 7.00                    | 0.681              | 114.43               | 5.952                 | 101.50            | 0.00671            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.631              | 1005.47              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.617              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.900              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.373              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 3.861                     | 980.839               | 1.000              | 19.00                   | 1.223               | 310.60               | 3.936                 | 275.50            | 0.00444            |
| TAKEOFF                            | 1.000               | 14500.0       | 213.495                   | 8565.398              | 1.000              | 0.70                    | 2.491               | 99.93                | 24.925                | 169.17            | 0.01472            |
| CLIMBOUT                           | 0.850               | 12325.0       | 133.188                   | 7193.688              | 1.000              | 2.20                    | 4.884               | 263.77               | 18.515                | 451.92            | 0.01081            |
| APPROACH                           | 0.400               | 5800.0        | 32.191                    | 3251.086              | 1.000              | 4.00                    | 2.146               | 216.74               | 9.902                 | 386.67            | 0.00555            |
| TAXI-IDLE                          | 0.060               | 870.0         | 3.861                     | 980.839               | 1.000              | 7.00                    | 0.450               | 114.43               | 3.936                 | 101.50            | 0.00444            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 11.193              | 1005.47              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 11.133              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.083               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 171.778             |                      |                       |                   |                    |

DATE: 7/21/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 353 ENGINE TYPE AND MODEL: JT-8D-9

SERIAL NUMBER: P-674550

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 30.08 FINISH 30.06

INLET AIR HUMIDITY, LBS H2O/LB AIR: -0.0000

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRANCO MEASURED PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-----------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1658.00    | 2/ 0      | 5000.00            | 34                       | 5770.00          | 9790.00                  | 2843.00         | 82.10    | 0.009500                            | -0.00                     | 1.29                         |
| 1738.00    | 3/ 2      | 9450.00            | 65                       | 7205.00          | 10810.00                 | 5250.00         | 123.40   | 0.012100                            | -0.00                     | 1.64                         |
| 1753.00    | 4/ 3      | 10770.00           | 74                       | 7515.00          | 11030.00                 | 6035.00         | 131.90   | 0.013000                            | -0.00                     | 1.75                         |
| 1806.00    | 5/ 4      | 11850.00           | 81                       | 7780.00          | 11205.00                 | 11205.00        | 140.00   | 0.013600                            | -0.00                     | 1.85                         |
| 1811.00    | 6/ 5      | 13600.00           | 93                       | 8250.00          | 11525.00                 | 8000.00         | 153.00   | 0.014800                            | -0.00                     | 2.04                         |
| 1831.00    | 7/ 6      | 780.00             | 5                        | 2600.00          | 6530.00                  | 908.00          | 29.40    | 0.008800                            | -0.00                     | 1.04                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO2 (WET) PPMV | NOx (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------|----------------|---------------|----------------|----------------|-----------|-------|--------------|
| 34                       | 700.00                     | 38.61                     | 11.00         | 2.59                | 1.80           | 167.00        | 8.60           | 175.60         | -0.00     | 16.00 | -0.00        |
| 65                       | 855.00                     | 48.68                     | 16.60         | 2.01                | 3.50           | 87.20         | 7.30           | 94.50          | -0.00     | 24.00 | -0.00        |
| 74                       | 900.00                     | 51.87                     | 14.10         | 2.32                | 1.30           | 105.00        | 7.70           | 112.80         | -0.00     | 25.00 | 12.00        |
| 81                       | 935.00                     | 54.83                     | 12.70         | 2.47                | 1.20           | 123.70        | 8.90           | 132.60         | -0.00     | 28.00 | 14.00        |
| 93                       | 995.00                     | 59.80                     | 11.00         | 2.72                | 4.60           | 162.30        | 9.70           | 172.00         | -0.00     | 31.00 | 16.00        |
| 5                        | 675.00                     | 31.27                     | 220.30        | 0.87                | 86.90          | 7.40          | 5.40           | 7.60           | -0.00     | 1.00  | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 34                       | 0.45                      | 0.08                      | 1.09                       | 3136.19                    | 21.14                     | 22.23                      | 7.41              | 0.23              | 3.09               | 8916.20            | 60.10             | 63.20              |
| 65                       | 1.65                      | 0.20                      | 1.19                       | 3134.61                    | 14.72                     | 15.41                      | 8.65              | 1.04              | 6.25               | 16456.70           | 74.64             | 80.88              |
| 74                       | 1.21                      | 0.06                      | 1.04                       | 3135.66                    | 14.84                     | 15.94                      | 7.32              | 0.39              | 6.57               | 18923.73           | 89.53             | 96.19              |
| 81                       | 1.03                      | 0.05                      | 1.18                       | 3135.98                    | 16.42                     | 17.60                      | 11.50             | 0.62              | 13.24              | 35138.66           | 183.97            | 197.20             |
| 93                       | 0.81                      | 0.19                      | 1.17                       | 3135.95                    | 19.56                     | 20.73                      | 6.46              | 1.55              | 9.35               | 25087.57           | 156.49            | 165.84             |
| 5                        | 48.84                     | 11.03                     | 1.97                       | 3030.73                    | 0.87                      | 2.77                       | 44.35             | 10.02             | 1.79               | 2751.90            | 0.79              | 2.51               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO2 LB/1K#TH-HR | NOx LB/1K#TH-HR |
|--------------------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|
| 34                       | 0.482          | 1783.240        | 0.045           | 12.020         | 0.619           | 12.639          |
| 65                       | 0.915          | 1741.449        | 0.111           | 7.898          | 0.661           | 8.559           |
| 74                       | 0.680          | 1757.078        | 0.036           | 8.313          | 0.610           | 8.931           |
| 81                       | 0.970          | 2965.288        | 0.053           | 15.525         | 1.117           | 16.642          |
| 93                       | 0.475          | 1844.675        | 0.114           | 11.507         | 0.688           | 12.194          |
| 5                        | 56.858         | 3528.077        | 12.845          | 1.017          | 2.289           | 3.222           |

CAL ID NUMBER: 353 ENGINE TYPE AND MODEL: JT-8D-9

SERIAL NUMBER: P-674550

TEST ORGANIZATION: PRATT & WHITNEY

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 40.473                    | 929.537               | 1.000              | 19.00                   | 12.816             | 294.35               | 43.541                | 275.50            | 0.04652            |
| TAKEOFF                            | 1.000               | 14500.0       | 4.577                     | 8597.602              | 1.000              | 0.70                    | 0.053              | 100.31               | 0.532                 | 169.17            | 0.00032            |
| CLIMBOUT                           | 0.850               | 12325.0       | 6.178                     | 7138.484              | 1.000              | 2.20                    | 0.227              | 261.74               | 0.865                 | 451.92            | 0.00050            |
| APPROACH                           | 0.400               | 5800.0        | 26.024                    | 3288.813              | 1.000              | 4.00                    | 1.735              | 219.25               | 7.913                 | 386.67            | 0.00449            |
| TAXI-IDLE                          | 0.060               | 870.0         | 40.473                    | 929.537               | 1.000              | 7.00                    | 4.722              | 108.45               | 43.541                | 101.50            | 0.04652            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 19.553             | 984.10               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 19.869             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 14.120             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.368              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 8.500                     | 929.537               | 1.000              | 19.00                   | 2.692              | 294.35               | 9.144                 | 275.50            | 0.00977            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.220                     | 8597.602              | 1.000              | 0.70                    | 0.003              | 100.31               | 0.026                 | 169.17            | 0.00002            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.420                     | 7138.484              | 1.000              | 2.20                    | 0.015              | 261.74               | 0.059                 | 451.92            | 0.00003            |
| APPROACH                           | 0.400               | 5800.0        | 1.643                     | 3288.813              | 1.000              | 4.00                    | 0.110              | 219.25               | 0.500                 | 386.67            | 0.00028            |
| TAXI-IDLE                          | 0.060               | 870.0         | 8.500                     | 929.537               | 1.000              | 7.00                    | 0.992              | 108.45               | 9.144                 | 101.50            | 0.00977            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.811              | 984.10               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.872              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.752              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.177              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.796                     | 929.537               | 1.000              | 19.00                   | 0.885               | 294.35               | 3.008                 | 275.50            | 0.00321            |
| TAKEOFF                            | 1.000               | 14500.0       | 197.465                   | 8597.602              | 1.000              | 0.70                    | 2.304               | 100.31               | 22.967                | 169.17            | 0.01362            |
| CLIMBOUT                           | 0.850               | 12325.0       | 131.913                   | 7138.484              | 1.000              | 2.20                    | 4.837               | 261.74               | 18.479                | 451.92            | 0.01070            |
| APPROACH                           | 0.400               | 5800.0        | 34.648                    | 3288.813              | 1.000              | 4.00                    | 2.310               | 219.25               | 10.535                | 386.67            | 0.00597            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.796                     | 929.537               | 1.000              | 7.00                    | 0.326               | 108.45               | 3.008                 | 101.50            | 0.00321            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.662              | 984.10               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.834              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.700               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 158.880             |                      |                       |                   |                    |

DATE: 8/20/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 357 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: P-666988

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 87.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 29.80 FINISH 29.76

INLET AIR HUMIDITY, LBS H2O/LB AIR: -0.0000

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRAND MEASURE

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATIO T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1359.00    | 1/ 0      | 5050.00                  | 34                 | 5790.00          | 9920.00                  | 2432.00                 | 82.30    | 0.009890                            | -0.00                     | 1.30                         |
| 1438.00    | 3/ 1      | 890.00                   | 6                  | 2640.00          | 6745.00                  | 910.00                  | 30.00    | 0.008430                            | -0.00                     | 1.04                         |
| 1714.00    | 4/ 3      | 9350.00                  | 64                 | 7165.00          | 10425.00                 | 5280.00                 | 118.60   | 0.012370                            | -0.00                     | 1.63                         |
| 1531.00    | 5/ 4      | 10550.00                 | 72                 | 7435.00          | 11120.00                 | 5990.00                 | 126.10   | 0.013190                            | -0.00                     | 1.73                         |
| 1541.00    | 6/ 5      | 11900.00                 | 82                 | 7760.00          | 11330.00                 | 6860.00                 | 135.50   | 0.014060                            | -0.00                     | 1.85                         |
| 1301.00    | 7/ 6      | 11550.00                 | 93                 | 8200.00          | 11640.00                 | 8110.00                 | 148.50   | 0.015170                            | -0.00                     | 2.02                         |

| POWER PERCENT RATIO T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 34                       | 715.00                     | 38.95                     | 41.90         | 1.68                 | 5.90           | 34.60         | 9.50            | 44.10           | -0.00     | 14.00 | -0.00        |
| 6                        | 690.00                     | 30.97                     | 189.20        | 1.07                 | 29.60          | 0.20          | 5.30            | 5.50            | -0.00     | 1.00  | -0.00        |
| 64                       | 865.00                     | 47.96                     | 17.40         | 2.38                 | 4.90           | 85.70         | 9.70            | 95.40           | -0.00     | 22.00 | -0.00        |
| 72                       | 905.00                     | 50.75                     | 14.70         | 2.54                 | 3.20           | 102.60        | 9.70            | 112.50          | -0.00     | 23.00 | -0.00        |
| 82                       | 950.00                     | 54.22                     | 12.70         | 2.73                 | 3.30           | 127.40        | 11.90           | 139.30          | -0.00     | 24.00 | -0.00        |
| 93                       | 1015.00                    | 58.81                     | 10.60         | 3.20                 | 5.00           | 165.70        | 13.30           | 179.00          | -0.00     | 24.00 | -0.00        |

| POWER PERCENT RATIO T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 34                       | 4.97                      | 0.40                      | 1.85                       | 3128.84                    | 6.74                      | 8.59                       | 14.56             | 1.17              | 5.42               | 9173.77            | 19.75             | 25.17              |
| 6                        | 34.60                     | 3.10                      | 1.59                       | 3074.87                    | 0.06                      | 1.65                       | 31.49             | 2.82              | 1.45               | 2798.13            | 0.05              | 1.50               |
| 64                       | 1.46                      | 0.24                      | 1.34                       | 3134.81                    | 11.80                     | 13.14                      | 7.70              | 1.24              | 7.05               | 16551.78           | 62.31             | 69.36              |
| 72                       | 1.15                      | 0.14                      | 1.28                       | 3135.53                    | 13.24                     | 14.52                      | 6.92              | 0.86              | 7.65               | 18781.84           | 79.31             | 86.96              |
| 82                       | 0.93                      | 0.14                      | 1.43                       | 3135.91                    | 15.30                     | 16.73                      | 6.37              | 0.95              | 9.80               | 21512.32           | 104.95            | 114.75             |
| 93                       | 0.66                      | 0.18                      | 1.36                       | 3136.22                    | 16.98                     | 18.34                      | 5.36              | 1.45              | 11.05              | 25434.70           | 137.68            | 148.73             |

| POWER PERCENT RATIO T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 34                       | 2.884          | 1816.587         | 0.233           | 3.911          | 1.074            | 4.985            |
| 6                        | 35.382         | 3141.967         | 3.170           | 0.061          | 1.628            | 1.689            |
| 64                       | 0.824          | 1770.244         | 0.133           | 6.664          | 0.754            | 7.418            |
| 72                       | 0.656          | 1790.270         | 0.082           | 7.518          | 0.725            | 8.243            |
| 82                       | 0.535          | 1807.758         | 0.080           | 8.819          | 0.824            | 9.643            |
| 93                       | 0.396          | 1877.100         | 0.107           | 10.161         | 0.816            | 10.977           |

CAL ID NUMBER: 357 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-666988

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 29.299                    | 908.189               | 1.000              | 19.00                   | 9.278              | 287.59               | 32.261                | 275.50            | 0.03368            |
| TAKEOFF                            | 1.000               | 14500.0       | 3.432                     | 8798.668              | 1.000              | 0.70                    | 0.040              | 102.65               | 0.390                 | 169.17            | 0.00024            |
| CLIMBOUT                           | 0.850               | 12325.0       | 5.425                     | 7390.512              | 1.000              | 2.20                    | 0.199              | 270.99               | 0.734                 | 451.92            | 0.00044            |
| APPROACH                           | 0.400               | 5800.0        | 13.595                    | 3364.328              | 1.000              | 4.00                    | 0.906              | 224.29               | 4.041                 | 386.67            | 0.00234            |
| TAXI-IDLE                          | 0.060               | 870.0         | 29.299                    | 908.189               | 1.000              | 7.00                    | 3.418              | 105.96               | 32.261                | 101.50            | 0.03368            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 13.842             | 991.47               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.961             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.996              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.276              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.812                     | 908.189               | 1.000              | 19.00                   | 0.891              | 287.59               | 3.097                 | 275.50            | 0.00323            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.735                     | 8798.668              | 1.000              | 0.70                    | 0.009              | 102.65               | 0.084                 | 169.17            | 0.00005            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.926                     | 7390.512              | 1.000              | 2.20                    | 0.034              | 270.99               | 0.125                 | 451.92            | 0.00008            |
| APPROACH                           | 0.400               | 5800.0        | 1.169                     | 3364.328              | 1.000              | 4.00                    | 0.078              | 224.29               | 0.348                 | 386.67            | 0.00020            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.812                     | 908.189               | 1.000              | 7.00                    | 0.328              | 105.96               | 3.097                 | 101.50            | 0.00323            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 1.339              | 991.47               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 1.351              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 0.967              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.591              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 1.875                     | 908.189               | 1.000              | 19.00                   | 0.594               | 287.59               | 2.064                 | 275.50            | 0.00215            |
| TAKEOFF                            | 1.000               | 14500.0       | 177.574                   | 8798.668              | 1.000              | 0.70                    | 2.072               | 102.65               | 20.182                | 169.17            | 0.01225            |
| CLIMBOUT                           | 0.850               | 12325.0       | 125.448                   | 7390.512              | 1.000              | 2.20                    | 4.600               | 270.99               | 16.974                | 451.92            | 0.01018            |
| APPROACH                           | 0.400               | 5800.0        | 31.438                    | 3364.328              | 1.000              | 4.00                    | 2.096               | 224.29               | 9.344                 | 386.67            | 0.00542            |
| TAXI-IDLE                          | 0.060               | 870.0         | 1.875                     | 908.189               | 1.000              | 7.00                    | 0.219               | 105.96               | 2.064                 | 101.50            | 0.00215            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.580               | 991.47               |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 9.662               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.918               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 142.876             |                      |                       |                   |                    |

DATE: 7/ 9/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 392 ENGINE TYPE AND MODEL: JT-8D-9

SERIAL NUMBER: P674552

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
 N1 TURBINE OVERHAUL: -0. HRS  
 N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C FUEL H/C RATIO: 2.000

OPERATIONAL DATA .....

INFLT AIR TEMPERATURE, DEGREES F: START 96.00 FINISH 96.00

ATMOSPHERIC PRESSURE: START 29.96 FINISH 29.96

INFLT AIR HUMIDITY, LBS H2O/LB AIR: 0.0099

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
 SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INFLT TEMP DEGREES F |       |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|-------|
| 1330.00    | 1/ 0      | 1100.00            | 7                        | 3040.00                | 7325.00                  | 1122.00                 | 33.50    | 0.009300                            | -0.00                     | 1.05                         | -0.00 |
| 1328.00    | 2/ 1      | 680.00             | 4                        | 2439.00                | 6420.00                  | 890.00                  | 27.60    | 0.009200                            | -0.00                     | 1.03                         | -0.00 |
| 1333.00    | 3/ 2      | 1600.00            | 11                       | 3590.00                | 8060.00                  | 1427.00                 | 39.70    | 0.009900                            | -0.00                     | 1.08                         | -0.00 |
| 1345.00    | 4/ 3      | 5000.00            | 34                       | 5775.00                | 9930.00                  | 2884.00                 | 71.50    | 0.011200                            | -0.00                     | 1.30                         | -0.00 |
| 1350.00    | 5/ 4      | 9050.00            | 62                       | 7100.00                | 10900.00                 | 5090.00                 | 115.90   | 0.012200                            | -0.00                     | 1.60                         | -0.00 |
| 1410.00    | 6/ 5      | 10350.00           | 71                       | 7410.00                | 11125.00                 | 5865.00                 | 123.70   | 0.013200                            | -0.00                     | 1.71                         | -0.00 |
| 1441.00    | 7/ 6      | 11550.00           | 79                       | 7715.00                | 11340.00                 | 6677.00                 | 131.00   | 0.014100                            | -0.00                     | 1.83                         | -0.00 |
| 1507.00    | 8/ 7      | 13100.00           | 90                       | 8115.00                | 11590.00                 | 7815.00                 | 143.20   | 0.015100                            | -0.00                     | 1.98                         | -0.00 |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 7                        | 730.00                     | 3145.00                   | 154.40        | 1.14                 | 35.40          | 10.70         | 3.00            | 13.70           | -0.00     | 1.00  | -0.00        |
| 4                        | 730.00                     | 30.76                     | 277.30        | 1.14                 | 115.60         | 8.50          | 5.10            | 13.60           | 30.00     | 1.00  | -0.00        |
| 11                       | 745.00                     | 32.15                     | 110.90        | 1.25                 | 19.10          | 13.60         | 3.40            | 17.00           | -0.00     | 2.00  | -0.00        |
| 34                       | 715.00                     | 38.51                     | 47.30         | 1.53                 | 5.30           | 32.60         | 5.60            | 38.20           | -0.00     | 12.00 | -0.00        |
| 62                       | 850.00                     | 47.36                     | 17.90         | 2.09                 | 0.30           | 80.00         | 5.20            | 85.20           | -0.00     | 24.00 | -0.00        |
| 71                       | 895.00                     | 50.52                     | 14.10         | 2.23                 | 0.20           | 99.40         | 5.90            | 105.30          | -0.00     | 26.00 | 13.00        |
| 79                       | 940.00                     | 53.90                     | 12.70         | 2.31                 | 4.30           | 116.90        | 7.90            | 124.80          | -0.00     | 27.00 | 14.00        |
| 90                       | 1000.00                    | 58.08                     | 10.50         | 2.48                 | 2.70           | 159.10        | 7.50            | 166.60          | -0.00     | 30.00 | 16.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 7                        | 26.94                     | 3.49                      | 0.85                       | 3095.83                    | 3.03                      | 3.88                       | 30.23             | 3.92              | 0.95               | 3462.30            | 3.40              | 4.35               |
| 4                        | 46.96                     | 11.21                     | 1.42                       | 3033.21                    | 2.35                      | 3.78                       | 41.79             | 9.98              | 1.26               | 2699.56            | 2.10              | 3.37               |
| 11                       | 17.52                     | 1.73                      | 0.88                       | 3105.47                    | 3.53                      | 4.42                       | 25.00             | 2.47              | 1.26               | 4431.51            | 5.04              | 6.30               |
| 34                       | 6.15                      | 0.39                      | 1.20                       | 3127.00                    | 6.97                      | 8.16                       | 17.74             | 1.14              | 3.45               | 9018.25            | 20.09             | 23.54              |
| 62                       | 1.71                      | 0.02                      | 0.82                       | 3135.02                    | 12.54                     | 13.36                      | 8.70              | 0.08              | 4.15               | 15957.22           | 63.85             | 68.00              |
| 71                       | 1.26                      | 0.01                      | 0.87                       | 3135.73                    | 14.61                     | 15.48                      | 7.40              | 0.06              | 5.09               | 18391.08           | 85.70             | 90.78              |
| 79                       | 1.11                      | 0.21                      | 1.12                       | 3135.41                    | 16.59                     | 17.71                      | 7.44              | 1.42              | 7.48               | 20935.13           | 110.75            | 118.24             |
| 90                       | 0.85                      | 0.12                      | 0.99                       | 3136.07                    | 21.03                     | 22.00                      | 6.60              | 0.97              | 7.75               | 24509.42           | 164.37            | 172.12             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 7                        | 27.483         | 3147.548         | 3.563           | 3.088          | 0.866            | 3.954            |
| 4                        | 61.460         | 1969.937         | 14.674          | 3.094          | 1.857            | 4.951            |
| 11                       | 15.625         | 2769.693         | 1.543           | 3.150          | 0.789            | 3.938            |
| 34                       | 3.549          | 1803.651         | 0.228           | 4.018          | 0.690            | 4.708            |
| 62                       | 0.961          | 1763.229         | 0.009           | 7.056          | 0.459            | 7.514            |
| 71                       | 0.715          | 1776.916         | 0.006           | 8.280          | 0.491            | 8.771            |
| 79                       | 0.644          | 1812.565         | 0.123           | 9.589          | 0.648            | 10.237           |
| 90                       | 0.504          | 1870.872         | 0.074           | 12.547         | 0.591            | 13.139           |

CAL ID NUMBER: 392 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P674552

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 32.660                    | 991.122               | 1.000              | 19.00                   | 10.342             | 313.86               | 32.952                | 275.50            | 0.03754            |
| TAKEOFF                            | 1.000               | 14500.0       | 2.205                     | 8698.324              | 1.000              | 0.70                    | 0.026              | 101.48               | 0.253                 | 169.17            | 0.00015            |
| CLIMBOUT                           | 0.850               | 12325.0       | 4.731                     | 7333.910              | 1.000              | 2.20                    | 0.173              | 268.91               | 0.645                 | 451.92            | 0.00038            |
| APPROACH                           | 0.400               | 5800.0        | 16.311                    | 3293.130              | 1.000              | 4.00                    | 1.087              | 219.54               | 4.953                 | 386.67            | 0.00281            |
| TAXI-IDLE                          | 0.060               | 870.0         | 32.660                    | 991.122               | 1.000              | 7.00                    | 3.810              | 115.63               | 32.952                | 101.50            | 0.03754            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.439             | 1019.42              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.145             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.149             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.177              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 7.153                     | 991.122               | 1.000              | 19.00                   | 2.265              | 313.86               | 7.217                 | 275.50            | 0.00822            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.508                     | 8698.324              | 1.000              | 0.70                    | 0.006              | 101.48               | 0.058                 | 169.17            | 0.00004            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.527                     | 7333.910              | 1.000              | 2.20                    | 0.019              | 268.91               | 0.072                 | 451.92            | 0.00004            |
| APPROACH                           | 0.400               | 5800.0        | 1.102                     | 3293.130              | 1.000              | 4.00                    | 0.073              | 219.54               | 0.335                 | 386.67            | 0.00019            |
| TAXI-IDLE                          | 0.060               | 870.0         | 7.153                     | 991.122               | 1.000              | 7.00                    | 0.835              | 115.63               | 7.217                 | 101.50            | 0.00822            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.199              | 1019.42              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 3.138              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.310              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.409              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 3.626                     | 991.122               | 1.000              | 19.00                   | 1.148               | 313.86               | 3.659                 | 275.50            | 0.00417            |
| TAKEOFF                            | 1.000               | 14500.0       | 2.29.109                  | 8698.324              | 1.000              | 0.70                    | 2.673               | 101.48               | 26.339                | 169.17            | 0.01580            |
| CLIMBOUT                           | 0.850               | 12325.0       | 146.356                   | 7333.910              | 1.000              | 2.20                    | 5.366               | 268.91               | 19.956                | 451.92            | 0.01187            |
| APPROACH                           | 0.400               | 5800.0        | 29.997                    | 3293.130              | 1.000              | 4.00                    | 2.000               | 219.54               | 9.109                 | 386.67            | 0.00517            |
| TAXI-IDLE                          | 0.060               | 870.0         | 3.626                     | 991.122               | 1.000              | 7.00                    | 0.423               | 115.63               | 3.659                 | 101.50            | 0.00417            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 11.611              | 1019.42              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 11.389              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.385               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 184.340             |                      |                       |                   |                    |

DATE: 7/14/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 394 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: P-665705

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 29.59 FINISH 29.58

INLET AIR HUMIDITY, LBS H2O/LR AIR: 0.0109

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPH | TURBINE INFLT TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1119.00    | 1/ 0      | 690.00                   | 4                  | 2410.00          | 6360.00                  | 879.00                  | 27.50    | 0.008900                            | -0.00                     | -0.00                        |
| 1124.00    | 2/ 1      | 1250.00                  | 8                  | 3190.00          | 7515.00                  | 1189.00                 | 36.20    | 0.009100                            | -0.00                     | -0.00                        |
| 1138.00    | 3/ 2      | 1740.00                  | 11                 | 3695.00          | 8130.00                  | 1487.00                 | 42.10    | 0.009800                            | -0.00                     | -0.00                        |
| 1142.00    | 4/ 3      | 5000.00                  | 34                 | 5750.00          | 9830.00                  | 2861.00                 | 85.20    | 0.009300                            | -0.00                     | -0.00                        |
| 1252.00    | 5/ 4      | 9470.00                  | 65                 | 7165.00          | 10860.00                 | 5340.00                 | 121.00   | 0.012300                            | -0.00                     | -0.00                        |
| 1303.00    | 6/ 5      | 10700.00                 | 73                 | 7440.00          | 11060.00                 | 6040.00                 | 128.00   | 0.013100                            | -0.00                     | -0.00                        |
| 1321.00    | 7/ 6      | 11720.00                 | 80                 | 7685.00          | 11270.00                 | 6700.00                 | 135.30   | 0.013800                            | -0.00                     | -0.00                        |
| 1339.00    | 8/ 7      | 13660.00                 | 94                 | 8200.00          | 11560.00                 | 9120.00                 | 149.30   | 0.015100                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 720.00                     | 30.59                     | 215.30        | 0.93                 | 81.30          | 5.60          | 1.00            | 6.60            | 5.00      | 2.00  | -0.00        |
| 8                        | 705.00                     | 31.38                     | 119.50        | 0.98                 | 30.70          | 6.90          | 2.20            | 9.10            | -0.00     | 6.00  | -0.00        |
| 11                       | 715.00                     | 32.18                     | 100.60        | 1.13                 | 16.10          | 10.90         | 2.00            | 12.90           | -0.00     | 5.00  | -0.00        |
| 34                       | 695.00                     | 38.26                     | 43.80         | 1.42                 | 4.10           | 29.30         | 4.60            | 33.90           | -0.00     | 13.00 | -0.00        |
| 65                       | 855.00                     | 48.19                     | 17.30         | 2.10                 | 1.50           | 78.30         | 4.60            | 82.90           | -0.00     | -0.00 | -0.00        |
| 73                       | 900.00                     | 51.17                     | 14.30         | 2.23                 | 1.10           | 96.60         | 5.80            | 102.40          | -0.00     | 24.00 | -0.00        |
| 80                       | 935.00                     | 53.66                     | 12.70         | 2.34                 | 1.70           | 118.30        | 3.90            | 122.20          | -0.00     | 24.00 | 12.00        |
| 94                       | 1005.00                    | 59.23                     | 10.30         | 2.64                 | 1.80           | 170.20        | 7.30            | 177.50          | -0.00     | 24.00 | 12.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 44.80                     | 7.69                      | 0.34                       | 3040.77                    | 1.91                      | 2.26                       | 35.38             | 8.52              | 0.30               | 2672.83            | 1.68              | 1.93               |
| 8                        | 23.99                     | 3.53                      | 0.73                       | 3090.38                    | 2.27                      | 3.00                       | 28.52             | 4.20              | 0.86               | 3674.46            | 2.70              | 3.57               |
| 11                       | 17.50                     | 1.61                      | 0.57                       | 3105.67                    | 3.13                      | 3.71                       | 26.17             | 2.40              | 0.85               | 4618.13            | 4.66              | 5.51               |
| 34                       | 6.14                      | 0.33                      | 1.06                       | 3127.20                    | 6.75                      | 7.80                       | 17.56             | 0.94              | 3.03               | 8946.91            | 19.30             | 22.33              |
| 65                       | 1.64                      | 0.08                      | 0.72                       | 3134.94                    | 12.22                     | 12.94                      | 8.78              | 0.44              | 3.83               | 16740.57           | 65.25             | 69.09              |
| 73                       | 1.28                      | 0.06                      | 0.85                       | 3135.58                    | 14.20                     | 15.05                      | 7.73              | 0.34              | 5.15               | 18938.91           | 85.76             | 90.91              |
| 80                       | 1.09                      | 0.08                      | 0.55                       | 3135.31                    | 16.57                     | 17.12                      | 7.26              | 0.56              | 3.66               | 21009.96           | 111.04            | 114.70             |
| 94                       | 0.78                      | 0.08                      | 0.91                       | 3136.31                    | 21.14                     | 22.04                      | 6.32              | 0.63              | 7.36               | 25466.81           | 171.64            | 179.00             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 57.075         | 3871.672         | 12.343          | 2.438          | 0.435            | 2.874            |
| 8                        | 22.813         | 2939.569         | 3.357           | 2.164          | 0.690            | 2.954            |
| 11                       | 15.038         | 2654.100         | 1.378           | 2.676          | 0.491            | 3.167            |
| 34                       | 3.513          | 1789.383         | 0.188           | 3.860          | 0.606            | 4.466            |
| 65                       | 0.927          | 1767.747         | 0.046           | 6.890          | 0.405            | 7.295            |
| 73                       | 0.722          | 1769.991         | 0.032           | 8.015          | 0.481            | 8.497            |
| 80                       | 0.619          | 1792.659         | 0.047           | 9.474          | 0.312            | 9.787            |
| 94                       | 0.463          | 1864.335         | 0.046           | 12.565         | 0.539            | 13.104           |

CAL ID NUMBER: 394 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-665705

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 32.759                    | 992.669               | 1.000              | 19.00                   | 10.374             | 314.34               | 33.001                | 275.50            | 0.03765            |
| TAKEOFF                            | 1.000               | 14500.0       | 3.174                     | 8600.570              | 1.000              | 0.70                    | 0.037              | 100.34               | 0.369                 | 169.17            | 0.00022            |
| CLIMBOUT                           | 0.850               | 12325.0       | 5.686                     | 7253.199              | 1.000              | 2.20                    | 0.208              | 265.95               | 0.784                 | 451.92            | 0.00046            |
| APPROACH                           | 0.400               | 5800.0        | 16.478                    | 3211.089              | 1.000              | 4.00                    | 1.099              | 214.07               | 5.132                 | 386.67            | 0.00284            |
| TAXI-IDLE                          | 0.060               | 870.0         | 32.759                    | 992.669               | 1.000              | 7.00                    | 3.822              | 115.81               | 33.001                | 101.50            | 0.03765            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 15.540             | 1010.52              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.378             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.222             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.255              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 6.495                     | 992.669               | 1.000              | 19.00                   | 2.057              | 314.34               | 6.543                 | 275.50            | 0.00747            |
| TAKEOFF                            | 1.000               | 14500.0       | 0.332                     | 8600.570              | 1.000              | 0.70                    | 0.004              | 100.34               | 0.039                 | 169.17            | 0.00002            |
| CLIMBOUT                           | 0.850               | 12325.0       | 0.350                     | 7253.199              | 1.000              | 2.20                    | 0.013              | 265.95               | 0.048                 | 451.92            | 0.00003            |
| APPROACH                           | 0.400               | 5800.0        | 1.017                     | 3211.089              | 1.000              | 4.00                    | 0.068              | 214.07               | 0.317                 | 386.67            | 0.00018            |
| TAXI-IDLE                          | 0.060               | 870.0         | 6.495                     | 992.669               | 1.000              | 7.00                    | 0.758              | 115.81               | 6.543                 | 101.50            | 0.00747            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 2.899              | 1010.52              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.869              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.094              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.267              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 870.0         | 2.237                     | 992.669               | 1.000              | 19.00                   | 0.708               | 314.34               | 2.253                 | 275.50            | 0.00257            |
| TAKEOFF                            | 1.000               | 14500.0       | 211.123                   | 8600.570              | 1.000              | 0.70                    | 2.463               | 100.34               | 24.548                | 169.17            | 0.01456            |
| CLIMBOUT                           | 0.850               | 12325.0       | 136.287                   | 7253.199              | 1.000              | 2.20                    | 4.997               | 265.95               | 18.790                | 451.92            | 0.01106            |
| APPROACH                           | 0.400               | 5800.0        | 27.182                    | 3211.089              | 1.000              | 4.00                    | 1.812               | 214.07               | 8.465                 | 386.67            | 0.00469            |
| TAXI-IDLE                          | 0.060               | 870.0         | 2.237                     | 992.669               | 1.000              | 7.00                    | 0.261               | 115.81               | 2.253                 | 101.50            | 0.00257            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.242              | 1010.52              |                       | 1384.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.135              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.396               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 169.869             |                      |                       |                   |                    |

DATE: 7/15/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 395 ENGINE TYPE AND MODEL: JT-8D-9

SERIAL NUMBER: P-665706

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4

FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 70.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 29.76 FINISH 29.76

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0103

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 921.00     | 1/ 0      | 720.00                   | 4                  | 2425.00          | 6340.00                  | 872.00                  | 0.008600 | -0.00                               | 1.03                      | -0.00                        |
| 933.00     | 2/ 1      | 1720.00                  | 8                  | 3150.00          | 7405.00                  | 1179.00                 | 0.009020 | -0.00                               | 1.06                      | -0.00                        |
| 943.00     | 3/ 2      | 1720.00                  | 11                 | 3680.00          | 8060.00                  | 1481.00                 | 0.009680 | -0.00                               | 1.09                      | -0.00                        |
| 950.00     | 4/ 3      | 5000.00                  | 34                 | 5735.00          | 9770.00                  | 2869.00                 | 0.009190 | -0.00                               | 1.30                      | -0.00                        |
| 1101.00    | 7/ 4      | 10800.00                 | 74                 | 7450.00          | 11035.00                 | 6065.00                 | 0.012970 | -0.00                               | 1.75                      | -0.00                        |
| 1113.00    | 8/ 7      | 11850.00                 | 81                 | 7680.00          | 11175.00                 | 6780.00                 | 0.013600 | -0.00                               | 1.85                      | -0.00                        |
| 1129.00    | 9/ 8      | 13600.00                 | 93                 | 8160.00          | 11500.00                 | 8010.00                 | 0.014700 | -0.00                               | 2.02                      | -0.00                        |
| 1140.00    | 6/ 7      | 9540.00                  | 65                 | 7150.00          | 10440.00                 | 5275.00                 | 0.012000 | -0.00                               | 1.64                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 700.00                     | 30.75                     | 216.70        | 0.97                 | 75.30          | 3.20          | 3.80            | 7.00            | 5.00      | 1.00  | -0.00        |
| 8                        | 705.00                     | 31.55                     | 118.30        | 0.99                 | 14.20          | 5.40          | 4.50            | 10.30           | -0.00     | 2.00  | -0.00        |
| 11                       | 720.00                     | 32.35                     | 93.40         | 1.07                 | 3.70           | 8.70          | 3.00            | 11.70           | -0.00     | 1.00  | -0.00        |
| 34                       | 690.00                     | 34.31                     | 46.80         | 1.40                 | 6.50           | 28.80         | 7.20            | 36.00           | -0.00     | 12.00 | -0.00        |
| 74                       | 890.00                     | 51.25                     | 14.50         | 2.26                 | 2.00           | 99.70         | 7.80            | 107.50          | -0.00     | 24.00 | 12.00        |
| 81                       | 920.00                     | 54.13                     | 17.50         | 8.30                 | 5.80           | 120.00        | 8.30            | 128.30          | -0.00     | 27.00 | 14.00        |
| 93                       | 990.00                     | 58.90                     | 10.80         | 8.10                 | 6.70           | 165.30        | 9.10            | 173.40          | -0.00     | 29.00 | 14.00        |
| 65                       | 840.00                     | 48.16                     | 17.00         | 8.70                 | 3.90           | 85.90         | 8.20            | 94.10           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|
| 4                        | 43.31                     | 8.62                      | 1.25                       | 3046.05                    | 1.05                      | 2.30                       | 37.77                     | 7.52                      | 1.09                       | 2656.15                    | 0.92                      | 2.00                       |
| 8                        | 23.55                     | 1.62                      | 1.47                       | 3096.31                    | 1.90                      | 3.37                       | 27.76                     | 1.91                      | 1.73                       | 3650.55                    | 2.24                      | 3.97                       |
| 11                       | 17.28                     | 0.39                      | 0.91                       | 3109.53                    | 2.64                      | 3.55                       | 25.58                     | 0.58                      | 1.35                       | 4605.21                    | 3.91                      | 5.76                       |
| 34                       | 6.29                      | 0.50                      | 1.59                       | 3126.49                    | 6.36                      | 7.95                       | 18.05                     | 1.44                      | 4.56                       | 8969.89                    | 18.25                     | 22.81                      |
| 74                       | 1.28                      | 0.10                      | 1.13                       | 3135.46                    | 14.46                     | 15.59                      | 7.77                      | 0.61                      | 6.86                       | 19016.54                   | 87.70                     | 44.56                      |
| 81                       | 0.30                      | 0.08                      | 0.33                       | 3137.05                    | 4.74                      | 5.07                       | 2.04                      | 0.54                      | 2.27                       | 21269.20                   | 32.15                     | 34.37                      |
| 93                       | 0.27                      | 0.09                      | 0.33                       | 3137.06                    | 6.69                      | 7.02                       | 2.13                      | 0.76                      | 2.63                       | 25127.88                   | 53.61                     | 56.23                      |
| 65                       | 0.41                      | 0.05                      | 0.33                       | 3136.94                    | 3.44                      | 3.76                       | 2.18                      | 0.29                      | 1.73                       | 16547.38                   | 18.12                     | 19.85                      |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 52.453         | 3589.103         | 10.439          | 1.272          | 1.511            | 2.783            |
| 8                        | 22.757         | 2992.253         | 1.564           | 1.833          | 1.422            | 3.254            |
| 11                       | 14.875         | 2677.449         | 0.337           | 2.276          | 0.785            | 3.061            |
| 34                       | 3.610          | 1793.978         | 0.287           | 3.449          | 0.912            | 4.562            |
| 74                       | 0.719          | 1760.790         | 0.057           | 8.120          | 0.635            | 8.756            |
| 81                       | 0.172          | 1794.870         | 0.046           | 2.713          | 0.188            | 2.900            |
| 93                       | 0.157          | 1847.638         | 0.056           | 3.942          | 0.193            | 4.135            |
| 65                       | 0.229          | 1734.526         | 0.030           | 1.900          | 0.181            | 2.081            |

CAL ID NUMBER: 395 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-665706

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 31.002                    | 949.518               | 1.000              | 19.00                   | 9.817              | 300.68               | 32.651                | 275.50            | 0.03563            |
| TAKEOFF   | 1.000               | 14500.0       | 0.564                     | 8544.902              | 1.000              | 0.70                    | 0.007              | 99.69                | 0.066                 | 169.17            | 0.00004            |
| CLIMBOUT  | 0.850               | 12325.0       | 1.913                     | 7198.484              | 1.000              | 2.20                    | 0.070              | 263.94               | 0.266                 | 451.92            | 0.00016            |
| APPROACH  | 0.400               | 5800.0        | 14.942                    | 3322.161              | 1.000              | 4.00                    | 0.996              | 221.48               | 4.498                 | 386.67            | 0.00258            |
| TAXI-IDLE | 0.060               | 870.0         | 31.002                    | 949.518               | 1.000              | 7.00                    | 3.617              | 110.78               | 32.651                | 101.50            | 0.03563            |

TOTAL FOR CYCLE: 14.507 996.57 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 14.557  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 10.476  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.045

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 5.558                     | 949.518               | 1.000              | 19.00                   | 1.760              | 300.68               | 5.854                 | 275.50            | 0.00639            |
| TAKEOFF   | 1.000               | 14500.0       | 0.302                     | 8544.902              | 1.000              | 0.70                    | 0.004              | 99.69                | 0.035                 | 169.17            | 0.00002            |
| CLIMBOUT  | 0.850               | 12325.0       | 0.482                     | 7198.484              | 1.000              | 2.20                    | 0.018              | 263.94               | 0.067                 | 451.92            | 0.00004            |
| APPROACH  | 0.400               | 5800.0        | 1.256                     | 3322.161              | 1.000              | 4.00                    | 0.084              | 221.48               | 0.378                 | 386.67            | 0.00022            |
| TAXI-IDLE | 0.060               | 870.0         | 5.558                     | 949.518               | 1.000              | 7.00                    | 0.648              | 110.78               | 5.854                 | 101.50            | 0.00639            |

TOTAL FOR CYCLE: 2.514 996.57 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 2.522  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.815  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.243

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 2.328                     | 949.518               | 1.000              | 19.00                   | 0.737               | 300.68               | 2.451                 | 275.50            | 0.00268            |
| TAKEOFF   | 1.000               | 14500.0       | 182.490                   | 8544.902              | 1.000              | 0.70                    | 2.129               | 99.69                | 21.357                | 169.17            | 0.01259            |
| CLIMBOUT  | 0.850               | 12325.0       | 129.329                   | 7198.484              | 1.000              | 2.20                    | 4.742               | 263.94               | 17.966                | 451.92            | 0.01049            |
| APPROACH  | 0.400               | 5800.0        | 28.989                    | 3322.161              | 1.000              | 4.00                    | 1.933               | 221.48               | 8.726                 | 386.67            | 0.00500            |
| TAXI-IDLE | 0.060               | 870.0         | 2.328                     | 949.518               | 1.000              | 7.00                    | 0.272               | 110.78               | 2.451                 | 101.50            | 0.00268            |

TOTAL FOR CYCLE: 9.812 996.57 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 9.846  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.086  
LBS POLLUTANT/1000K LB TH AT T.O.: 146.831

DATE: 7/16/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 396 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: P-665708

RATED THRUST: 14500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 84.00

ATMOSPHERIC PRESSURE: START 29.86 FINISH 29.87

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0099

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRAND MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | THRUST, LBS<br>N1<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE SPEED<br>RPM<br>N1 N2 | MEASURED FUEL FLOW<br>LB/HR | GAS GEN AIR FLOW<br>LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP<br>DEGREES F | ENGINE PRESSURE RATIO<br>EPR | TURBINE INLET TEMP<br>DEGREES F |
|------------|-----------|--------------------------|-----------------------------------|------------------------------|-----------------------------|----------------------------|----------|----------------------------------------|------------------------------|---------------------------------|
| 3128.00    | 1/ 0      | 5100.00                  | 35                                | 5785.00 9900.00              | 2911.00                     | 86.20                      | 0.009400 | -0.00                                  | 1.30                         | -0.00                           |
| 3142.00    | 2/ 1      | 740.00                   | 5                                 | 2615.00 6675.00              | 899.00                      | 29.40                      | 0.008500 | -0.00                                  | 1.04                         | -0.00                           |
| 1218.00    | 3/ 2      | 9500.00                  | 65                                | 7160.00 10935.00             | 5340.00                     | 119.90                     | 0.012400 | -0.00                                  | 1.63                         | -0.00                           |
| 1232.00    | 4/ 3      | 10750.00                 | 74                                | 7440.00 11140.00             | 6106.00                     | 127.90                     | 0.013300 | -0.00                                  | 1.75                         | -0.00                           |
| 1243.00    | 5/ 4      | 11950.00                 | 82                                | 7725.00 11340.00             | 6875.00                     | 135.70                     | 0.014100 | -0.00                                  | 1.85                         | -0.00                           |
| 1301.00    | 6/ 5      | 13650.00                 | 94                                | 8160.00 11635.00             | 8130.00                     | 148.30                     | 0.015200 | -0.00                                  | 2.02                         | -0.00                           |

| POWER PERCENT<br>RATED<br>T.O. | EXHAUST GAS TEMP<br>DEGREES F | EXHAUST GAS PRESSURE<br>PSIA | CO (WET)<br>PPMV | CO 2 (WET)<br>PERCENT V | THC (WET)<br>PPMV | NO (WET)<br>PPMV | NO 2 (WET)<br>PPMV | NO X (WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------------|-------------------------------|------------------------------|------------------|-------------------------|-------------------|------------------|--------------------|--------------------|-----------|-------|--------------|
| 35                             | 705.00                        | 38.61                        | 44.80            | 1.46                    | 6.00              | 30.90            | 6.10               | 37.00              | -0.00     | 15.00 | -0.00        |
| 5                              | 685.00                        | 30.95                        | 227.70           | 0.95                    | 102.10            | 7.20             | 4.70               | 11.90              | 7.00      | 1.00  | -0.00        |
| 65                             | 860.00                        | 48.17                        | 17.40            | 2.11                    | 3.30              | 85.30            | 7.80               | 93.10              | -0.00     | 19.00 | -0.00        |
| 74                             | 900.00                        | 51.36                        | 13.80            | 2.27                    | 4.60              | 105.90           | 8.80               | 114.70             | -0.00     | 21.00 | 10.00        |
| 82                             | 940.00                        | 54.44                        | 12.00            | 2.45                    | 3.20              | 131.80           | 9.70               | 141.50             | -0.00     | 23.00 | 12.00        |
| 94                             | 995.00                        | 59.12                        | 10.30            | 2.74                    | 1.90              | 174.50           | 10.40              | 184.90             | -0.00     | 25.00 | 12.00        |

| POWER PERCENT<br>RATED<br>T.O. | MASS EMI CO<br>LB/1K<br>LB FUEL | MASS EMI HC<br>LB/1K<br>LB FUEL | MASS EMI NO2<br>LB/1K<br>LB FUEL | MASS EMI CO2<br>LB/1K<br>LB FUEL | MASS EMI NO<br>LB/1K<br>LB FUEL | MASS EMI NOX<br>LB/1K<br>LB FUEL | MASS EMI CO<br>LB/HR | MASS EMI HC<br>LB/HR | MASS EMI NO2<br>LB/HR | MASS EMI CO2<br>LB/HR | MASS EMI NO<br>LB/HR | MASS EMI NOX<br>LB/HR |
|--------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|---------------------------------|----------------------------------|----------------------|----------------------|-----------------------|-----------------------|----------------------|-----------------------|
| 35                             | 6.11                            | 0.47                            | 1.37                             | 3126.87                          | 6.92                            | 8.28                             | 17.78                | 1.36                 | 3.98                  | 9102.30               | 20.14                | 24.11                 |
| 5                              | 46.26                           | 11.88                           | 1.57                             | 3032.47                          | 2.40                            | 3.97                             | 41.59                | 10.68                | 1.41                  | 2726.19               | 2.16                 | 3.57                  |
| 65                             | 1.65                            | 0.18                            | 1.21                             | 3134.67                          | 13.25                           | 14.46                            | 8.79                 | 0.95                 | 6.47                  | 16739.13              | 70.74                | 77.21                 |
| 74                             | 1.21                            | 0.23                            | 1.27                             | 3135.20                          | 15.29                           | 16.56                            | 7.41                 | 1.41                 | 7.76                  | 19143.54              | 93.36                | 101.12                |
| 82                             | 0.98                            | 0.15                            | 1.30                             | 3135.80                          | 17.64                           | 18.93                            | 6.72                 | 1.03                 | 8.92                  | 21558.62              | 121.24               | 130.16                |
| 94                             | 0.75                            | 0.08                            | 1.24                             | 3136.35                          | 20.88                           | 22.13                            | 6.10                 | 0.64                 | 10.12                 | 25498.49              | 169.76               | 179.68                |

| POWER PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO 2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO 2<br>LB/1K#TH-HR | NO X<br>LB/1K#TH-HR |
|--------------------------------|-------------------|---------------------|--------------------|-------------------|---------------------|---------------------|
| 35                             | 3.486             | 1784.766            | 0.267              | 3.949             | 0.780               | 4.728               |
| 5                              | 56.199            | 3684.041            | 14.432             | 2.919             | 1.905               | 4.824               |
| 65                             | 0.925             | 1762.014            | 0.100              | 7.447             | 0.681               | 8.128               |
| 74                             | 0.689             | 1790.795            | 0.132              | 8.685             | 0.722               | 9.407               |
| 82                             | 0.562             | 1804.068            | 0.086              | 10.146            | 0.747               | 10.892              |
| 94                             | 0.447             | 1868.021            | 0.047              | 12.437            | 0.741               | 13.178              |

CAL ID NUMBER: 396 ENGINE TYPE AND MODEL: JT-8D-9  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-665708

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 40.029                    | 967.974               | 1.000              | 19.00                   | 12.676             | 306.52               | 41.353                | 275.50            | 0.04601            |
| TAKEOFF   | 1.000               | 14500.0       | 5.033                     | 8707.441              | 1.000              | 0.70                    | 0.059              | 101.59               | 0.578                 | 169.17            | 0.00035            |
| CLIMBOUT  | 0.850               | 12325.0       | 5.883                     | 7332.477              | 1.000              | 2.20                    | 0.216              | 268.86               | 0.802                 | 451.92            | 0.00048            |
| APPROACH  | 0.400               | 5800.0        | 17.377                    | 3342.371              | 1.000              | 4.00                    | 1.158              | 222.82               | 5.199                 | 386.67            | 0.00300            |
| TAXI-IDLE | 0.060               | 870.0         | 40.029                    | 967.974               | 1.000              | 7.00                    | 4.670              | 112.93               | 41.353                | 101.50            | 0.04601            |

TOTAL FOR CYCLE: 18.779 1012.72 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 18.543  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 13.561  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.405

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 9.150                     | 967.974               | 1.000              | 19.00                   | 2.898              | 306.52               | 9.453                 | 275.50            | 0.01052            |
| TAKEOFF   | 1.000               | 14500.0       | 0.209                     | 8707.441              | 1.000              | 0.70                    | 0.002              | 101.59               | 0.024                 | 169.17            | 0.00001            |
| CLIMBOUT  | 0.850               | 12325.0       | 0.370                     | 7332.477              | 1.000              | 2.20                    | 0.014              | 268.86               | 0.050                 | 451.92            | 0.00003            |
| APPROACH  | 0.400               | 5800.0        | 1.249                     | 3342.371              | 1.000              | 4.00                    | 0.083              | 222.82               | 0.374                 | 386.67            | 0.00022            |
| TAXI-IDLE | 0.060               | 870.0         | 9.150                     | 967.974               | 1.000              | 7.00                    | 1.068              | 112.93               | 9.453                 | 101.50            | 0.01052            |

TOTAL FOR CYCLE: 4.064 1012.72 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.013  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 2.935  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.168

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 870.0         | 3.953                     | 967.974               | 1.000              | 19.00                   | 1.252               | 306.52               | 4.084                 | 275.50            | 0.00454            |
| TAKEOFF   | 1.000               | 14500.0       | 208.563                   | 8707.441              | 1.000              | 0.70                    | 2.433               | 101.59               | 23.952                | 169.17            | 0.01438            |
| CLIMBOUT  | 0.850               | 12325.0       | 145.595                   | 7332.477              | 1.000              | 2.20                    | 5.338               | 268.86               | 19.856                | 451.92            | 0.01181            |
| APPROACH  | 0.400               | 5800.0        | 30.365                    | 3342.371              | 1.000              | 4.00                    | 2.024               | 222.82               | 9.085                 | 386.67            | 0.00524            |
| TAXI-IDLE | 0.060               | 870.0         | 3.953                     | 967.974               | 1.000              | 7.00                    | 0.461               | 112.93               | 4.084                 | 101.50            | 0.00454            |

TOTAL FOR CYCLE: 11.509 1012.72 1384.75  
LBS POLLUTANT/1K LB FUEL/CYCLE: 11.365  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.311  
LBS POLLUTANT/1000K LB TH AT T.O.: 167.809

DATE: 7/12/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 393 ENGINE TYPE AND MODEL: JT8D-11 SERIAL NUMBER: P676215

RATED THRUST: 15000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START -0.00 FINISH -0.00

ATMOSPHERIC PRESSURE: START -0.00 FINISH -0.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: -0.0000

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 9

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG  
SMOKE DENSITY IS VON BRANCO MEASURE PARTICULATES ARE IN MG/M\*\*3

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1033.00    | 1/ 0      | 1350.00                  | 8                  | 3250.00                | 7545.00                  | 1293.00                 | 37.70    | 0.009500                            | -0.00                     | 1.07                         |
| 1040.00    | 2/ 1      | 1870.00                  | 12                 | 3760.00                | 8160.00                  | 1596.00                 | 43.70    | 0.010100                            | -0.00                     | 1.10                         |
| 1058.00    | 3/ 2      | 850.00                   | 5                  | 2605.00                | 6640.00                  | 945.00                  | 30.20    | 0.008700                            | -0.00                     | 1.04                         |
| 1121.00    | 4/ 3      | 5070.00                  | 33                 | 5675.00                | 9740.00                  | 2930.00                 | 71.00    | 0.011200                            | -0.00                     | 1.29                         |
| 1222.00    | 5/ 4      | 9550.00                  | 63                 | 7110.00                | 10770.00                 | 5465.00                 | 122.00   | 0.012400                            | -0.00                     | 1.64                         |
| 1239.00    | 6/ 5      | 10920.00                 | 72                 | 7380.00                | 10990.00                 | 6275.00                 | 129.60   | 0.013500                            | -0.00                     | 1.75                         |
| 1254.00    | 7/ 6      | 12000.00                 | 79                 | 7625.00                | 11155.00                 | 6950.00                 | 136.00   | 0.014200                            | -0.00                     | 1.86                         |
| 1310.00    | 8/ 7      | 13360.00                 | 89                 | 7950.00                | 11370.00                 | 7930.00                 | 146.60   | 0.015000                            | -0.00                     | 1.98                         |
| 1331.00    | 9/ 8      | 14330.00                 | 95                 | 8220.00                | 11545.00                 | 8640.00                 | 1537.00  | 0.015600                            | -0.00                     | 2.07                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 9                        | 715.00                     | 32.09                     | 136.80        | 1.14                 | 31.60          | 17.60         | 5.10            | 17.70           | -0.00     | 2.00  | -0.00        |
| 12                       | 735.00                     | 32.88                     | 110.30        | 1.23                 | 12.40          | 15.50         | 6.40            | 21.90           | -0.00     | 3.00  | -0.00        |
| 5                        | 675.00                     | 31.29                     | 214.40        | 1.09                 | 74.60          | 5.10          | 5.80            | 10.90           | 6.00      | 1.00  | -0.00        |
| 33                       | 710.00                     | 38.65                     | 46.30         | 1.53                 | 4.90           | 33.40         | 7.50            | 40.90           | -0.00     | 15.00 | -0.00        |
| 63                       | 860.00                     | 48.70                     | 15.60         | 2.25                 | 1.20           | 95.80         | 7.60            | 103.40          | -0.00     | 25.00 | -0.00        |
| 72                       | 905.00                     | 51.89                     | 13.70         | 2.41                 | 0.70           | 118.80        | 8.50            | 127.30          | -0.00     | 27.00 | -0.00        |
| 79                       | 940.00                     | 54.88                     | 12.00         | 2.53                 | 0.50           | 142.40        | 10.00           | 152.40          | -0.00     | 28.00 | 14.00        |
| 89                       | 985.00                     | 58.45                     | 10.50         | 2.69                 | 1.40           | 175.10        | 11.90           | 187.00          | -0.00     | 29.00 | 14.00        |
| 95                       | 1025.00                    | 60.94                     | 9.90          | 2.79                 | 1.70           | 198.30        | 15.60           | 213.90          | -0.00     | 31.00 | 16.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/FUEL | MASS EMI HC LB/FUEL | MASS EMI NO2 LB/FUEL | MASS EMI CO2 LB/FUEL | MASS EMI NO LB/FUEL | MASS EMI NOX LB/FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 8                        | 23.62               | 3.12                | 1.45                 | 3092.07              | 3.57                | 5.02                 | 30.53             | 4.04              | 1.87               | 3998.05            | 4.62              | 6.49               |
| 12                       | 17.73               | 1.14                | 1.69                 | 3106.76              | 4.09                | 5.78                 | 28.30             | 1.82              | 2.70               | 4958.38            | 6.53              | 9.23               |
| 5                        | 38.27               | 7.63                | 1.70                 | 3056.70              | 1.50                | 3.20                 | 36.16             | 7.21              | 1.61               | 2888.58            | 1.41              | 3.02               |
| 33                       | 6.02                | 0.37                | 1.60                 | 3127.28              | 7.14                | 8.74                 | 17.65             | 1.07              | 4.70               | 9162.93            | 20.91             | 25.61              |
| 63                       | 1.38                | 0.06                | 1.11                 | 3135.40              | 13.96               | 15.06                | 7.56              | 0.33              | 6.05               | 17134.98           | 76.27             | 82.32              |
| 72                       | 1.13                | 0.03                | 1.16                 | 3135.87              | 16.16               | 17.32                | 7.12              | 0.21              | 7.26               | 19677.59           | 101.40            | 108.66             |
| 79                       | 0.95                | 0.02                | 1.30                 | 3136.20              | 18.45               | 19.75                | 6.58              | 0.16              | 9.01               | 21796.56           | 128.25            | 137.26             |
| 89                       | 0.78                | 0.06                | 1.46                 | 3136.35              | 21.42               | 22.88                | 6.20              | 0.47              | 11.54              | 24871.26           | 169.88            | 181.42             |
| 95                       | 0.71                | 0.07                | 1.83                 | 3136.44              | 23.30               | 25.14                | 6.12              | 0.60              | 15.84              | 27098.83           | 201.35            | 217.19             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 8                        | 22.618         | 2961.518         | 2.992           | 3.422          | 1.385            | 4.807            |
| 12                       | 15.133         | 2651.543         | 0.974           | 3.493          | 1.442            | 4.935            |
| 5                        | 42.543         | 3398.333         | 8.478           | 1.662          | 1.890            | 3.553            |
| 33                       | 3.481          | 1807.285         | 0.211           | 4.124          | 0.926            | 5.051            |
| 63                       | 0.792          | 1794.239         | 0.035           | 7.986          | 0.634            | 8.620            |
| 72                       | 0.652          | 1801.978         | 0.019           | 9.286          | 0.664            | 9.950            |
| 79                       | 0.548          | 1816.380         | 0.013           | 10.688         | 0.751            | 11.438           |
| 89                       | 0.464          | 1861.621         | 0.035           | 12.715         | 0.864            | 13.579           |
| 95                       | 0.427          | 1891.056         | 0.047           | 14.051         | 1.105            | 15.156           |

CAL ID NUMBER: 393 ENGINE TYPE AND MODEL: JT8D-11  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P676215

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 900.0         | 34.864                    | 1019.034              | 1.000              | 19.00                   | 11.040             | 322.69               | 34.213                | 285.00            | 0.03874            |
| TAKEOFF                            | 1.000               | 15000.0       | 1.798                     | 9035.734              | 1.000              | 0.70                    | 0.021              | 105.42               | 0.199                 | 175.00            | 0.00012            |
| CLIMBOUT                           | 0.850               | 12750.0       | 4.675                     | 7648.832              | 1.000              | 2.20                    | 0.171              | 280.46               | 0.611                 | 467.50            | 0.00037            |
| APPROACH                           | 0.400               | 6000.0        | 16.356                    | 3488.132              | 1.000              | 4.00                    | 1.090              | 232.54               | 4.689                 | 400.00            | 0.00273            |
| TAXI-IDLE                          | 0.060               | 900.0         | 34.864                    | 1019.034              | 1.000              | 7.00                    | 4.068              | 118.89               | 34.213                | 105.00            | 0.03874            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 16.391             | 1060.00              |                       | 1432.50           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.463             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 11.442             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.140              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 900.0         | 7.003                     | 1019.034              | 1.000              | 19.00                   | 2.218              | 322.69               | 6.872                 | 285.00            | 0.00778            |
| TAKEOFF                            | 1.000               | 15000.0       | 0.0                       | 9035.734              | 1.000              | 0.70                    | 0.0                | 105.42               | 0.0                   | 175.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 12750.0       | 0.045                     | 7648.832              | 1.000              | 2.20                    | 0.002              | 280.46               | 0.006                 | 467.50            | 0.00000            |
| APPROACH                           | 0.400               | 6000.0        | 0.945                     | 3488.132              | 1.000              | 4.00                    | 0.063              | 232.54               | 0.271                 | 400.00            | 0.00016            |
| TAXI-IDLE                          | 0.060               | 900.0         | 7.003                     | 1019.034              | 1.000              | 7.00                    | 0.817              | 118.89               | 6.872                 | 105.00            | 0.00778            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 3.099              | 1060.00              |                       | 1432.50           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 2.924              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.164              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.060               | 900.0         | 3.423                     | 1019.034              | 1.000              | 19.00                   | 1.084               | 322.69               | 3.359                 | 285.00            | 0.00380            |
| TAKEOFF                            | 1.000               | 15000.0       | 241.876                   | 9035.734              | 1.000              | 0.70                    | 2.822               | 105.42               | 26.769                | 175.00            | 0.01613            |
| CLIMBOUT                           | 0.850               | 12750.0       | 164.505                   | 7648.832              | 1.000              | 2.20                    | 6.032               | 280.46               | 21.507                | 467.50            | 0.01290            |
| APPROACH                           | 0.400               | 6000.0        | 34.660                    | 3488.132              | 1.000              | 4.00                    | 2.311               | 232.54               | 9.937                 | 400.00            | 0.00578            |
| TAXI-IDLE                          | 0.060               | 900.0         | 3.423                     | 1019.034              | 1.000              | 7.00                    | 0.399               | 118.89               | 3.359                 | 105.00            | 0.00380            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 12.648              | 1060.00              |                       | 1432.50           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 11.932              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.829               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 188.126             |                      |                       |                   |                    |

DATE: 7/ 7/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 61 ENGINE TYPE AND MODEL: JT9D

SERIAL NUMBER: X-495-14A

RATED THRUST: 43500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C

FUEL H/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 81.60 FINISH 76.30

ATMOSPHERIC PRESSURE: START 29.97 FINISH 30.00

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0100

RELATIVE HUMIDITY: 42.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

D-7 SHORT CONE

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS FGN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 2121.00       | 1/ 0         | 2948.00                           | 6                        | 1022.50                | 4956.00                           | 1732.00                       | 45.64       | 0.010500                                     | 837.30                             | 1.02                                  |
| 2138.00       | 2/ 1         | 4028.00                           | 9                        | 1185.60                | 5330.00                           | 2071.00                       | 53.39       | 0.010800                                     | 885.40                             | 1.02                                  |
| 2148.00       | 3/ 2         | 10167.00                          | 23                       | 1860.60                | 6386.00                           | 4246.00                       | 86.51       | 0.013600                                     | 1061.20                            | 1.07                                  |
| 2201.00       | 4/ 3         | 31208.00                          | 71                       | 2989.60                | 7252.00                           | 11879.00                      | 165.40      | 0.019960                                     | 1321.60                            | 1.28                                  |
| 2213.00       | 5/ 4         | 36753.00                          | 84                       | 3172.00                | 7394.00                           | 14183.00                      | 181.71      | 0.021690                                     | 1370.30                            | 1.36                                  |
| 2222.00       | 6/ 5         | 40470.00                          | 94                       | 3302.80                | 7556.00                           | 16052.00                      | 192.71      | 0.023100                                     | 1407.40                            | 1.42                                  |
| 2232.00       | 7/ 6         | 33044.00                          | 75                       | 3045.60                | 7288.00                           | 12588.00                      | 175.00      | 0.020000                                     | 1333.00                            | 1.31                                  |
| 2243.00       | 8/ 7         | 20780.00                          | 47                       | 2543.00                | 7168.00                           | 8470.00                       | 129.50      | 0.018200                                     | 1232.00                            | 1.16                                  |
| 2250.00       | 9/ 8         | 7538.00                           | 17                       | 1610.50                | 6048.00                           | 3250.00                       | 75.10       | 0.012000                                     | 995.40                             | 1.05                                  |
| 2303.00       | 10/ 9        | 3413.00                           | 7                        | 1107.80                | 5151.00                           | 1882.00                       | 52.20       | 0.010000                                     | 857.60                             | 1.02                                  |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WFT)<br>PPMV | CO<br>2<br>(WFT)<br>PERCENT V | THC<br>(WFT)<br>PPMV | NO<br>(WFT)<br>PPMV | NO<br>2<br>(WFT)<br>PPMV | NO<br>X<br>(WFT)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 6                                 | 670.50                              | 14.94                              | 488.00              | 1.59                          | 243.00               | 9.30                | 4.50                     | 13.80                    | -0.00     | -0.00 | -0.00        |
| 9                                 | 675.90                              | 15.03                              | 361.50              | 1.68                          | 68.90                | 12.00               | 8.10                     | 20.10                    | -0.00     | -0.00 | -0.00        |
| 23                                | 768.00                              | 15.64                              | 84.20               | 2.24                          | 14.70                | 41.70               | 9.00                     | 50.70                    | -0.00     | -0.00 | -0.00        |
| 71                                | 953.80                              | 18.66                              | 12.20               | 3.37                          | 6.30                 | 226.00              | 12.50                    | 238.50                   | -0.00     | -0.00 | -0.00        |
| 84                                | 1010.10                             | 19.70                              | 11.00               | 3.64                          | 5.80                 | 319.00              | 16.90                    | 335.90                   | -0.00     | -0.00 | -0.00        |
| 94                                | 1524.10                             | 20.57                              | 11.60               | 3.84                          | 7.60                 | 404.10              | 21.60                    | 425.70                   | -0.00     | -0.00 | -0.00        |
| 75                                | 1436.10                             | 18.98                              | 11.20               | 3.38                          | 6.30                 | 251.70              | 14.50                    | 266.20                   | -0.00     | -0.00 | -0.00        |
| 47                                | 1387.00                             | 16.96                              | 17.70               | 3.00                          | 6.90                 | 141.10              | 10.60                    | 151.70                   | -0.00     | -0.00 | -0.00        |
| 17                                | 1168.10                             | 15.36                              | 150.60              | 1.88                          | 34.10                | 26.80               | 12.40                    | 39.20                    | -0.00     | -0.00 | -0.00        |
| 7                                 | 1116.70                             | 14.98                              | 423.20              | 1.57                          | 184.30               | 6.90                | 11.20                    | 19.10                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 6                                 | 58.40                              | 14.71                              | 0.89                                | 2999.83                             | 1.83                               | 2.72                                | 101.49                  | 28.94                   | 1.54                     | 5195.70                  | 3.18                    | 4.71                     |
| 9                                 | 41.90                              | 4.57                               | 1.54                                | 3059.37                             | 2.28                               | 3.83                                | 86.77                   | 9.47                    | 3.19                     | 6335.95                  | 4.73                    | 7.92                     |
| 23                                | 7.47                               | 0.75                               | 1.31                                | 3123.95                             | 6.08                               | 7.39                                | 31.73                   | 3.17                    | 5.57                     | 13264.29                 | 25.81                   | 31.39                    |
| 71                                | 0.72                               | 0.21                               | 1.22                                | 3134.02                             | 21.99                              | 23.20                               | 8.58                    | 2.54                    | 14.45                    | 37252.82                 | 261.17                  | 275.61                   |
| 84                                | 0.60                               | 0.18                               | 1.52                                | 3136.30                             | 28.73                              | 30.26                               | 8.56                    | 2.58                    | 21.59                    | 44482.09                 | 407.53                  | 429.12                   |
| 94                                | 0.60                               | 0.23                               | 1.84                                | 3136.18                             | 34.50                              | 36.35                               | 9.68                    | 3.63                    | 29.60                    | 50341.86                 | 553.82                  | 583.42                   |
| 75                                | 0.66                               | 0.21                               | 1.41                                | 3136.12                             | 24.41                              | 25.82                               | 8.33                    | 2.68                    | 17.70                    | 39477.48                 | 307.32                  | 325.03                   |
| 47                                | 1.18                               | 0.26                               | 1.16                                | 3135.18                             | 15.42                              | 16.57                               | 9.91                    | 2.18                    | 9.75                     | 26198.25                 | 129.80                  | 139.55                   |
| 17                                | 15.84                              | 2.95                               | 2.14                                | 3107.22                             | 4.63                               | 6.77                                | 51.49                   | 6.68                    | 6.96                     | 10098.46                 | 15.05                   | 22.01                    |
| 7                                 | 51.92                              | 12.93                              | 2.25                                | 3020.86                             | 1.39                               | 3.64                                | 97.53                   | 24.33                   | 4.24                     | 5685.25                  | 2.61                    | 6.85                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 6                                 | 34.427            | 1762.449               | 9.818              | 1.078             | 0.521                  | 1.599                  |
| 9                                 | 21.542            | 1572.976               | 2.351              | 1.175             | 0.793                  | 1.967                  |
| 23                                | 3.121             | 1304.642               | 0.312              | 2.539             | 0.548                  | 3.087                  |
| 71                                | 0.275             | 1193.695               | 0.081              | 8.369             | 0.463                  | 8.831                  |
| 84                                | 0.233             | 1210.299               | 0.070              | 11.088            | 0.587                  | 11.676                 |
| 94                                | 0.236             | 1228.750               | 0.089              | 13.518            | 0.723                  | 14.240                 |
| 75                                | 0.252             | 1194.695               | 0.081              | 9.300             | 0.536                  | 9.836                  |
| 47                                | 0.477             | 1270.369               | 0.105              | 6.246             | 0.469                  | 6.715                  |
| 17                                | 6.830             | 1339.673               | 0.886              | 1.996             | 0.924                  | 2.920                  |
| 7                                 | 28.577            | 1665.763               | 7.128              | 0.765             | 1.242                  | 2.008                  |

CAL ID NUMBER: 61 ENGINE TYPE AND MODEL: JT9D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-495-14A

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 112.534                   | 1889.137              | 1.000              | 19.00                   | 35.636             | 598.23               | 59.569                | 964.25            | 0.03696            |
| TAKEOFF                            | 1.000               | 43500.0       | 18.885                    | 17066.461             | 1.000              | 0.70                    | 0.220              | 199.11               | 1.107                 | 507.50            | 0.00043            |
| CLIMBOUT                           | 0.850               | 36975.0       | 18.179                    | 14537.785             | 1.000              | 2.20                    | 0.667              | 533.05               | 1.250                 | 1355.75           | 0.00049            |
| APPROACH                           | 0.300               | 13050.0       | 26.695                    | 5458.695              | 1.000              | 4.00                    | 1.780              | 363.91               | 4.890                 | 870.00            | 0.00205            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 112.534                   | 1889.137              | 1.000              | 7.00                    | 13.129             | 220.40               | 59.569                | 355.25            | 0.03696            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 51.431             | 1914.70              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 26.861             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 12.690             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.506              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 85.205                    | 1889.137              | 1.000              | 19.00                   | 26.982             | 598.23               | 45.103                | 964.25            | 0.02798            |
| TAKEOFF                            | 1.000               | 43500.0       | 6.622                     | 17066.461             | 1.000              | 0.70                    | 0.077              | 199.11               | 0.388                 | 507.50            | 0.00015            |
| CLIMBOUT                           | 0.850               | 36975.0       | 5.641                     | 14537.785             | 1.000              | 2.20                    | 0.207              | 533.05               | 0.388                 | 1355.75           | 0.00015            |
| APPROACH                           | 0.300               | 13050.0       | 5.542                     | 5458.695              | 1.000              | 4.00                    | 0.369              | 363.91               | 1.015                 | 870.00            | 0.00042            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 85.205                    | 1889.137              | 1.000              | 7.00                    | 9.941              | 220.40               | 45.103                | 355.25            | 0.02798            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 37.576             | 1914.70              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 19.625             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.272              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.776              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 5.822                     | 1889.137              | 1.000              | 19.00                   | 1.844               | 598.23               | 3.082                 | 964.25            | 0.00191            |
| TAKEOFF                            | 1.000               | 43500.0       | 681.509                   | 17066.461             | 1.000              | 0.70                    | 7.951               | 199.11               | 39.933                | 507.50            | 0.01567            |
| CLIMBOUT                           | 0.850               | 36975.0       | 444.902                   | 14537.785             | 1.000              | 2.20                    | 16.313              | 533.05               | 30.603                | 1355.75           | 0.01203            |
| APPROACH                           | 0.300               | 13050.0       | 50.315                    | 5458.695              | 1.000              | 4.00                    | 3.354               | 363.91               | 9.217                 | 870.00            | 0.00386            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 5.822                     | 1889.137              | 1.000              | 7.00                    | 0.679               | 220.40               | 3.082                 | 355.25            | 0.00191            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 30.141              | 1914.70              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 15.742              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.437               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 182.780             |                      |                       |                   |                    |

DATE: 7/ 8/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 147 ENGINE TYPE AND MODEL: JT9D

SERIAL NUMBER: X-495-148

RATED THRUST: 43500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4C

FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.20 FINISH 84.60

ATMOSPHERIC PRESSURE: START 30.07 FINISH 30.07

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.1100

RELATIVE HUMIDITY: 47.50 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 10

COMMENTS:

D-7 SHORT CONE

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1050.00    | 1/ 0      | 2742.00                  | 6                  | 1023.40          | 4977.00                  | 1749.00                 | 0.011630 | 839.00                              | 1.02                      | 11308.00                     |
| 1059.00    | 2/ 1      | 3764.00                  | 8                  | 1191.40          | 5370.00                  | 2102.00                 | 0.011900 | 888.10                              | 1.02                      | 1191.00                      |
| 1112.00    | 3/ 2      | 11040.00                 | 25                 | 1977.00          | 6622.00                  | 4846.00                 | 0.016090 | 1101.20                             | 1.08                      | 1619.20                      |
| 1133.00    | 4/ 3      | 30841.00                 | 70                 | 3032.80          | 7420.00                  | 12463.00                | 0.022690 | 1352.20                             | 1.29                      | 2136.80                      |
| 1140.00    | 5/ 4      | 37004.00                 | 85                 | 3242.40          | 7580.00                  | 15218.00                | 0.025000 | 1405.80                             | 1.38                      | 2347.80                      |
| 1151.00    | 6/ 5      | 34530.00                 | 79                 | 3172.00          | 7503.80                  | 14128.00                | 0.024070 | 1384.60                             | 1.35                      | 2282.50                      |
| 1203.00    | 7/ 6      | 33946.00                 | 78                 | 3144.10          | 7484.70                  | 13834.00                | 0.024000 | 1377.70                             | 1.33                      | 2203.20                      |
| 1212.00    | 8/ 7      | 21482.00                 | 49                 | 2652.90          | 7108.60                  | 8618.00                 | 0.019350 | 1255.90                             | 1.18                      | 1937.30                      |
| 1225.00    | 9/ 8      | 7306.00                  | 16                 | 1642.20          | 6178.60                  | 3397.00                 | 0.015780 | 1019.40                             | 1.05                      | 1418.00                      |
| 1238.00    | 10/ 9     | 3323.00                  | 7                  | 1130.80          | 5272.10                  | 1960.00                 | 0.011770 | 876.20                              | 1.02                      | 1172.70                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 6                        | 1130.20                    | 14.94                     | 1069.00       | 1.58                 | 233.00         | 7.50          | 8.20            | 15.70           | -0.00     | -0.00 | -0.00        |
| 8                        | 1138.50                    | 15.03                     | 751.70        | 1.66                 | 127.50         | 10.80         | 10.70           | 21.50           | -0.00     | -0.00 | -0.00        |
| 25                       | 1269.70                    | 15.78                     | 55.90         | 2.43                 | 7.70           | 54.90         | 8.70            | 63.60           | -0.00     | -0.00 | -0.00        |
| 70                       | 1444.00                    | 18.82                     | 10.60         | 3.70                 | 2.10           | 278.60        | 17.30           | 295.90          | -0.00     | -0.00 | -0.00        |
| 85                       | 1570.70                    | 20.08                     | 9.70          | 4.01                 | 4.50           | 411.10        | 24.00           | 435.10          | -0.00     | -0.00 | -0.00        |
| 79                       | 1497.20                    | 19.54                     | 9.50          | 3.86                 | 9.70           | 344.50        | 21.30           | 365.80          | -0.00     | -0.00 | -0.00        |
| 78                       | 1492.40                    | 19.34                     | 9.70          | 3.78                 | 9.60           | 322.10        | 20.20           | 342.30          | -0.00     | -0.00 | -0.00        |
| 49                       | 1366.60                    | 17.17                     | 15.90         | 2.97                 | 5.70           | 136.50        | 10.70           | 147.20          | -0.00     | -0.00 | -0.00        |
| 16                       | 1200.40                    | 15.36                     | 116.80        | 2.05                 | 21.90          | 28.50         | 13.60           | 42.10           | -0.00     | -0.00 | -0.00        |
| 7                        | 1145.10                    | 14.99                     | 369.40        | 1.67                 | 141.10         | 6.90          | 13.30           | 20.20           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 6                        | 124.83                    | 15.58                     | 1.57                       | 2898.87                    | 1.44                      | 3.01                       | 218.32            | 27.25             | 2.75               | 5070.11            | 2.52              | 5.27               |
| 8                        | 85.88                     | 8.34                      | 2.01                       | 2979.92                    | 2.03                      | 4.03                       | 180.52            | 17.54             | 4.22               | 6263.79            | 4.26              | 8.48               |
| 25                       | 4.57                      | 0.36                      | 1.17                       | 3129.57                    | 7.39                      | 8.56                       | 22.16             | 1.75              | 5.68               | 15165.88           | 35.82             | 41.50              |
| 70                       | 0.57                      | 0.06                      | 1.53                       | 3136.67                    | 24.69                     | 26.27                      | 7.13              | 0.81              | 19.11              | 39092.29           | 307.72            | 326.83             |
| 85                       | 0.48                      | 0.13                      | 1.96                       | 3136.63                    | 33.62                     | 35.58                      | 7.35              | 1.95              | 29.87              | 47733.28           | 511.57            | 541.44             |
| 79                       | 0.49                      | 0.29                      | 1.81                       | 3136.18                    | 29.26                     | 31.07                      | 6.94              | 4.06              | 25.56              | 44308.00           | 413.40            | 438.96             |
| 78                       | 0.51                      | 0.29                      | 1.75                       | 3136.14                    | 27.94                     | 29.69                      | 7.09              | 4.02              | 24.24              | 43385.41           | 386.46            | 410.71             |
| 49                       | 1.07                      | 0.22                      | 1.18                       | 3135.46                    | 15.06                     | 16.25                      | 9.21              | 1.89              | 10.18              | 27021.43           | 129.83            | 140.00             |
| 16                       | 11.30                     | 1.21                      | 2.16                       | 3116.66                    | 4.53                      | 6.69                       | 38.39             | 4.12              | 7.34               | 10587.28           | 15.39             | 22.73              |
| 7                        | 42.86                     | 9.38                      | 2.53                       | 3044.67                    | 1.32                      | 3.85                       | 84.01             | 18.38             | 4.97               | 5967.55            | 2.58              | 7.55               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 6                        | 79.622         | 1849.057         | 9.939           | 0.918          | 1.003            | 1.921            |
| 8                        | 47.961         | 1664.130         | 4.659           | 1.132          | 1.121            | 2.253            |
| 25                       | 2.008          | 1373.720         | 0.159           | 3.244          | 0.514            | 3.759            |
| 70                       | 0.231          | 1267.543         | 0.026           | 9.978          | 0.620            | 10.597           |
| 85                       | 0.199          | 1289.950         | 0.053           | 13.825         | 0.807            | 14.632           |
| 79                       | 0.201          | 1283.174         | 0.118           | 11.972         | 0.740            | 12.712           |
| 78                       | 0.209          | 1278.072         | 0.118           | 11.385         | 0.714            | 12.099           |
| 49                       | 0.429          | 1257.864         | 0.088           | 6.044          | 0.474            | 6.517            |
| 16                       | 5.255          | 1449.122         | 0.564           | 2.106          | 1.005            | 3.111            |
| 7                        | 25.282         | 1795.834         | 5.531           | 0.776          | 1.495            | 2.271            |

CAL ID NUMBER: 147 ENGINE TYPE AND MODEL: JT9D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-495-148

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 129.265                   | 1844.465              | 1.000              | 19.00                   | 40.934             | 584.08               | 70.083                | 964.25            | 0.04245            |
| TAKEOFF                            | 1.000               | 43500.0       | 4.727                     | 18016.625             | 1.000              | 0.70                    | 0.055              | 210.19               | 0.262                 | 507.50            | 0.00011            |
| CLIMBOUT                           | 0.850               | 36975.0       | 11.819                    | 15128.035             | 1.000              | 2.20                    | 0.433              | 554.69               | 0.781                 | 1355.75           | 0.00032            |
| APPROACH                           | 0.300               | 13050.0       | 22.675                    | 5462.012              | 1.000              | 4.00                    | 1.512              | 364.13               | 4.151                 | 870.00            | 0.00174            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 129.265                   | 1844.465              | 1.000              | 7.00                    | 15.081             | 215.19               | 70.083                | 355.25            | 0.04245            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 58.015             | 1928.29              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 30.086             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 14.315             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.127              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 23.592                    | 1844.465              | 1.000              | 19.00                   | 7.471              | 584.08               | 12.791                | 964.25            | 0.00775            |
| TAKEOFF                            | 1.000               | 43500.0       | 2.786                     | 18016.625             | 1.000              | 0.70                    | 0.033              | 210.19               | 0.155                 | 507.50            | 0.00006            |
| CLIMBOUT                           | 0.850               | 36975.0       | 3.114                     | 15128.035             | 1.000              | 2.20                    | 0.114              | 554.69               | 0.206                 | 1355.75           | 0.00008            |
| APPROACH                           | 0.300               | 13050.0       | 1.353                     | 5462.012              | 1.000              | 4.00                    | 0.090              | 364.13               | 0.248                 | 870.00            | 0.00010            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 23.592                    | 1844.465              | 1.000              | 7.00                    | 2.752              | 215.19               | 12.791                | 355.25            | 0.00775            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 10.460             | 1928.29              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 5.425              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.581              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.747              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 6.737                     | 1844.465              | 1.000              | 19.00                   | 2.134               | 584.08               | 3.653                 | 964.25            | 0.00221            |
| TAKEOFF                            | 1.000               | 43500.0       | 904.633                   | 18016.625             | 1.000              | 0.70                    | 10.554              | 210.19               | 50.211                | 507.50            | 0.02080            |
| CLIMBOUT                           | 0.850               | 36975.0       | 538.073                   | 15128.035             | 1.000              | 2.20                    | 19.729              | 554.69               | 35.568                | 1355.75           | 0.01455            |
| APPROACH                           | 0.300               | 13050.0       | 54.637                    | 5462.012              | 1.000              | 4.00                    | 3.642               | 364.13               | 10.003                | 870.00            | 0.00419            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 6.737                     | 1844.465              | 1.000              | 7.00                    | 0.786               | 215.19               | 3.653                 | 355.25            | 0.00221            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 36.845              | 1928.29              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 19.108              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.091               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 242.622             |                      |                       |                   |                    |

DATE: 7/ 8/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 148 ENGINE TYPE AND MODEL: JT90

SERIAL NUMBER: X-495-14C

RATED THRUST: 43500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS

N1 TURBINE OVERHAUL: -0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-5

FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 89.40 FINISH 88.30

ATMOSPHERIC PRESSURE: START 30.03 FINISH 30.02

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0083

RELATIVE HUMIDITY: 21.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 7

COMMENTS:

D-7 SHORT CONE

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2       | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|----------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1711.00    | 1/ 0      | 2482.00                  | 5                  | 996.00           | 4898.00 | 1700.00  | 44.24                    | 0.010680                | 379.00   | 1.01                                | 1120.80                   |                              |
| 1723.00    | 2/ 1      | 3493.00                  | 8                  | 1166.00          | 5310.00 | 2063.00  | 51.75                    | 0.011070                | 433.40   | 1.02                                | 1195.10                   |                              |
| 1730.00    | 3/ 2      | 10968.00                 | 25                 | 1984.00          | 6642.00 | 4930.00  | 90.15                    | 0.015190                | 657.10   | 1.08                                | 1644.40                   |                              |
| 1752.00    | 4/ 3      | 31280.00                 | 71                 | 3061.00          | 7381.00 | 12778.00 | 167.13                   | 0.021240                | 903.10   | 1.30                                | 2198.60                   |                              |
| 1759.00    | 5/ 4      | 16151.00                 | 83                 | 3231.00          | 7564.00 | 15004.00 | 181.26                   | 0.022990                | 953.70   | 1.37                                | 2339.00                   |                              |
| 1828.00    | 6/ 5      | 33051.00                 | 75                 | 3130.00          | 7433.00 | 13610.00 | 172.24                   | 0.021950                | 921.40   | 1.32                                | 2254.00                   |                              |
| 1830.00    | 7/ 6      | 21006.00                 | 48                 | 2640.00          | 7050.00 | 8540.00  | 133.73                   | 0.017740                | 794.80   | 1.17                                | 1910.10                   |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 678.30                     | 14.90                     | 468.10        | 1.80                 | 240.60         | 9.60          | 11.10           | 20.70           | -0.00     | -0.00 | -0.00        |
| 8                        | 697.90                     | 14.99                     | 340.50        | 1.83                 | 132.80         | 13.80         | 15.30           | 29.10           | -0.00     | -0.00 | -0.00        |
| 25                       | 814.50                     | 15.75                     | 73.00         | 2.49                 | 9.50           | 62.40         | 13.00           | 75.40           | -0.00     | -0.00 | -0.00        |
| 71                       | 1015.30                    | 18.92                     | 9.90          | 3.58                 | 2.20           | 314.10        | 17.50           | 331.60          | -0.00     | -0.00 | -0.00        |
| 83                       | 1082.00                    | 19.89                     | 9.80          | 4.00                 | 0.90           | 445.40        | 25.20           | 490.60          | -0.00     | -0.00 | -0.00        |
| 75                       | 1039.10                    | 19.21                     | 10.00         | 3.75                 | 2.30           | 367.60        | 20.30           | 387.90          | -0.00     | -0.00 | -0.00        |
| 48                       | 899.30                     | 17.09                     | 22.40         | 2.87                 | 2.50           | 143.00        | 11.90           | 154.90          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 40.07                     | 14.74                     | 1.95                       | 3025.41                    | 1.69                      | 3.64                       | 85.13             | 25.06             | 3.37               | 5143.19            | 2.87              | 6.18               |
| 8                        | 36.30                     | 8.11                      | 2.68                       | 3065.25                    | 2.42                      | 5.10                       | 74.88             | 16.73             | 5.53               | 6321.60            | 4.99              | 10.51              |
| 25                       | 5.85                      | 0.44                      | 1.71                       | 3134.14                    | 8.21                      | 9.92                       | 28.83             | 2.15              | 8.43               | 15451.30           | 40.48             | 48.91              |
| 71                       | 0.55                      | 0.07                      | 1.61                       | 3143.46                    | 28.83                     | 30.44                      | 7.07              | 0.90              | 20.53              | 40167.16           | 368.42            | 388.94             |
| 83                       | 0.49                      | 0.03                      | 2.07                       | 3143.68                    | 38.24                     | 40.31                      | 7.35              | 0.39              | 31.06              | 47167.82           | 573.71            | 604.78             |
| 75                       | 0.53                      | 0.07                      | 1.78                       | 3143.49                    | 32.21                     | 33.99                      | 7.26              | 0.96              | 24.21              | 42782.94           | 438.43            | 462.64             |
| 48                       | 1.56                      | 0.10                      | 1.36                       | 3141.80                    | 16.36                     | 17.73                      | 13.33             | 0.85              | 11.63              | 26830.95           | 139.76            | 151.39             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 34.297         | 2072.197         | 10.096          | 1.155          | 1.336            | 2.491            |
| 8                        | 21.438         | 1810.365         | 4.789           | 1.427          | 1.582            | 3.009            |
| 25                       | 2.629          | 1408.762         | 0.196           | 3.691          | 0.769            | 4.460            |
| 71                       | 0.226          | 1284.117         | 0.029           | 11.778         | 0.656            | 12.434           |
| 83                       | 0.203          | 1304.745         | 0.011           | 15.870         | 0.859            | 16.729           |
| 75                       | 0.220          | 1294.452         | 0.029           | 13.265         | 0.733            | 13.998           |
| 48                       | 0.634          | 1277.300         | 0.041           | 6.653          | 0.554            | 7.207            |

CAL ID NUMBER: 148 ENGINE TYPE AND MODEL: JT9D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-495-14C

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 84.971                    | 1899.832              | 1.000              | 19.00                   | 26.907             | 601.61               | 44.726                | 964.25            | 0.02791            |
| TAKEOFF                            | 1.000               | 43500.0       | 7.947                     | 17927.234             | 1.000              | 0.70                    | 0.093              | 209.15               | 0.443                 | 507.50            | 0.00018            |
| CLIMBOUT                           | 0.850               | 36975.0       | 8.013                     | 15234.750             | 1.000              | 2.20                    | 0.294              | 558.61               | 0.526                 | 1355.75           | 0.00022            |
| APPROACH                           | 0.300               | 13050.0       | 26.390                    | 5647.430              | 1.000              | 4.00                    | 1.739              | 376.50               | 4.673                 | 870.00            | 0.00202            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 84.971                    | 1899.832              | 1.000              | 7.00                    | 9.913              | 221.65               | 44.726                | 355.25            | 0.02791            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 38.967             | 1967.51              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 19.805             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.615              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.213              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 20.312                    | 1899.832              | 1.000              | 19.00                   | 6.432              | 601.61               | 10.691                | 964.25            | 0.00667            |
| TAKEOFF                            | 1.000               | 43500.0       | 3.657                     | 17927.234             | 1.000              | 0.70                    | 0.043              | 209.15               | 0.204                 | 507.50            | 0.00008            |
| CLIMBOUT                           | 0.850               | 36975.0       | 3.108                     | 15234.750             | 1.000              | 2.20                    | 0.114              | 558.61               | 0.204                 | 1355.75           | 0.00008            |
| APPROACH                           | 0.300               | 13050.0       | 2.509                     | 5647.430              | 1.000              | 4.00                    | 0.167              | 376.50               | 0.444                 | 870.00            | 0.00019            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 20.312                    | 1899.832              | 1.000              | 7.00                    | 2.370              | 221.65               | 10.691                | 355.25            | 0.00667            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.126              | 1967.51              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.638              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.252              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.981              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 7.631                     | 1899.832              | 1.000              | 19.00                   | 2.417               | 601.61               | 4.017                 | 964.25            | 0.00251            |
| TAKEOFF                            | 1.000               | 43500.0       | 958.718                   | 17927.234             | 1.000              | 0.70                    | 11.185              | 209.15               | 53.478                | 507.50            | 0.02204            |
| CLIMBOUT                           | 0.850               | 36975.0       | 616.146                   | 15234.750             | 1.000              | 2.20                    | 22.592              | 558.61               | 40.443                | 1355.75           | 0.01666            |
| APPROACH                           | 0.300               | 13050.0       | 62.475                    | 5647.430              | 1.000              | 4.00                    | 4.165               | 376.50               | 11.063                | 870.00            | 0.00479            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 7.631                     | 1899.832              | 1.000              | 7.00                    | 0.890               | 221.65               | 4.017                 | 355.25            | 0.00251            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 41.249              | 1967.51              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 20.965              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 10.178              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 257.127             |                      |                       |                   |                    |

DATE: 7/ 8/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 149 ENGINE TYPE AND MODEL: JT9D SERIAL NUMBER: X-495-140

RATED THRUST: 43500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 88.00 FINISH 70.20

ATMOSPHERIC PRESSURE: START 30.02 FINISH 30.02

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0104

RELATIVE HUMIDITY: 29.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

D-7 SHORT CONE

| CLOCK TIME | TEST MODE | POWER THRUST, LBS UR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1840.00    | 1/ 0      | 7297.00                  | 16                 | 1668.00          | 3504.00                  | 75.68                   | 0.012860 | 568.50                              | 1.05                      | 1427.10                      |
| 1853.00    | 2/ 1      | 2951.00                  | 6                  | 1082.00          | 5119.00                  | 48.23                   | 0.010780 | 404.80                              | 1.02                      | 1150.50                      |
| 2303.00    | 3/ 2      | 10942.00                 | 25                 | -0.00            | 6538.00                  | 4925.00                 | 0.015180 | -0.00                               | -0.00                     | -0.00                        |
| 31.00      | 4/ 3      | 30560.00                 | 70                 | 2999.00          | 7230.00                  | 12255.00                | 0.020270 | 852.20                              | 1.29                      | 2046.00                      |
| 119.00     | 5/ 4      | 33713.00                 | 77                 | 3100.00          | 7306.00                  | 13540.00                | 0.021150 | 877.40                              | 1.33                      | 2124.10                      |
| 433.00     | 6/ 5      | 2909.00                  | 6                  | 1046.00          | 4974.00                  | 1827.00                 | 0.010580 | 369.30                              | 1.02                      | 1103.30                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO <sub>2</sub> (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO <sub>2</sub> (WET) PPMV | NO <sub>x</sub> (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------------------|----------------|---------------|----------------------------|----------------------------|-----------|-------|--------------|
| 16                       | 748.00                     | 15.32                     | 136.00        | 2.12                            | 26.00          | 41.10         | 15.90                      | 57.00                      | -0.00     | -0.00 | -0.00        |
| 6                        | 677.00                     | 14.93                     | 892.30        | 1.80                            | 173.90         | 17.10         | 13.50                      | 30.60                      | -0.00     | -0.00 | -0.00        |
| 25                       | -0.00                      | -0.00                     | 69.30         | 2.53                            | 5.40           | 50.90         | 8.30                       | 59.20                      | -0.00     | -0.00 | -0.00        |
| 70                       | 958.00                     | 18.78                     | 11.10         | 3.60                            | 4.00           | 224.40        | 13.80                      | 238.20                     | -0.00     | -0.00 | -0.00        |
| 77                       | 983.10                     | 19.38                     | 10.70         | 3.80                            | 2.50           | 268.70        | 0.40                       | 269.10                     | -0.00     | -0.00 | -0.00        |
| 6                        | 640.70                     | 14.96                     | 555.00        | 1.62                            | 338.80         | 7.00          | 0.50                       | 7.50                       | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO <sub>2</sub> LB/1K LB FUEL | MASS EMI CO <sub>2</sub> LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NO <sub>x</sub> LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO <sub>2</sub> LB/HR | MASS EMI CO <sub>2</sub> LB/HR | MASS EMI NO LB/HR | MASS EMI NO <sub>x</sub> LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------------------|----------------------------------------|---------------------------|----------------------------------------|-------------------|-------------------|--------------------------------|--------------------------------|-------------------|--------------------------------|
| 16                       | 12.74                     | 1.40                      | 2.45                                   | 3120.68                                | 6.32                      | 8.77                                   | 44.65             | 4.89              | 8.57                           | 10934.85                       | 22.16             | 30.74                          |
| 6                        | 87.64                     | 10.49                     | 2.33                                   | 2978.05                                | 2.96                      | 5.29                                   | 163.97            | 19.62             | 4.37                           | 5571.93                        | 5.53              | 9.90                           |
| 25                       | 5.47                      | 0.24                      | 1.08                                   | 3135.27                                | 6.59                      | 7.67                                   | 26.92             | 1.20              | 5.30                           | 15441.19                       | 32.48             | 37.77                          |
| 70                       | 0.62                      | 0.13                      | 1.26                                   | 3143.21                                | 20.48                     | 21.74                                  | 7.56              | 1.56              | 15.44                          | 38520.00                       | 251.01            | 266.44                         |
| 77                       | 0.56                      | 0.08                      | 0.03                                   | 3143.43                                | 23.24                     | 23.27                                  | 7.63              | 1.02              | 0.47                           | 42562.07                       | 314.62            | 315.09                         |
| 6                        | 64.98                     | 22.72                     | 0.10                                   | 2980.10                                | 1.35                      | 1.44                                   | 118.72            | 41.51             | 0.18                           | 5444.64                        | 2.46              | 2.44                           |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO <sub>2</sub> LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO <sub>2</sub> LB/1K#TH-HR | NO <sub>x</sub> LB/1K#TH-HR |
|--------------------------|----------------|-----------------------------|-----------------|----------------|-----------------------------|-----------------------------|
| 16                       | 6.118          | 1498.540                    | 0.670           | 3.037          | 1.175                       | 4.212                       |
| 6                        | 55.566         | 1888.151                    | 6.649           | 1.875          | 1.480                       | 3.356                       |
| 25                       | 2.456          | 1408.610                    | 0.110           | 2.963          | 0.483                       | 3.446                       |
| 70                       | 0.247          | 1260.471                    | 0.051           | 8.214          | 0.505                       | 8.719                       |
| 77                       | 0.226          | 1261.734                    | 0.030           | 9.327          | 0.014                       | 9.341                       |
| 6                        | 40.810         | 1871.655                    | 14.268          | 0.845          | 0.060                       | 0.906                       |

CAL ID NUMBER: 149 ENGINE TYPE AND MODEL: JT9D  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: X-495-140

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 160.584                   | 1971.791              | 1.000              | 19.00                   | 50.852             | 624.40               | 81.441                | 964.25            | 0.05274            |
| TAKEOFF                            | 1.000               | 43500.0       | 10.779                    | 17325.500             | 1.000              | 0.70                    | 0.126              | 202.13               | 0.622                 | 507.50            | 0.00025            |
| CLIMBOUT                           | 0.850               | 36975.0       | 13.259                    | 14807.000             | 1.000              | 2.20                    | 0.486              | 542.92               | 0.895                 | 1355.75           | 0.00036            |
| APPROACH                           | 0.300               | 13050.0       | 29.600                    | 5789.273              | 1.000              | 4.00                    | 1.973              | 385.95               | 5.113                 | 870.00            | 0.00227            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 160.584                   | 1971.791              | 1.000              | 7.00                    | 18.735             | 230.04               | 81.441                | 355.25            | 0.05274            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 72.172             | 1985.45              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 36.350             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 17.808             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.289              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 19.548                    | 1971.791              | 1.000              | 19.00                   | 6.190              | 624.40               | 9.914                 | 964.25            | 0.00642            |
| TAKEOFF                            | 1.000               | 43500.0       | 3.436                     | 17325.500             | 1.000              | 0.70                    | 0.040              | 202.13               | 0.198                 | 507.50            | 0.00008            |
| CLIMBOUT                           | 0.850               | 36975.0       | 2.009                     | 14807.000             | 1.000              | 2.20                    | 0.074              | 542.92               | 0.136                 | 1355.75           | 0.00005            |
| APPROACH                           | 0.300               | 13050.0       | 1.485                     | 5789.273              | 1.000              | 4.00                    | 0.099              | 385.95               | 0.256                 | 870.00            | 0.00011            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 19.548                    | 1971.791              | 1.000              | 7.00                    | 2.281              | 230.04               | 9.914                 | 355.25            | 0.00642            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.683              | 1985.45              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.374              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 2.143              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.922              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3045.0        | 3.297                     | 1971.791              | 1.000              | 19.00                   | 1.044               | 624.40               | 1.672                 | 964.25            | 0.00108            |
| TAKEOFF                            | 1.000               | 43500.0       | 575.381                   | 17325.500             | 1.000              | 0.70                    | 6.713               | 202.13               | 33.210                | 507.50            | 0.01323            |
| CLIMBOUT                           | 0.850               | 36975.0       | 403.784                   | 14807.000             | 1.000              | 2.20                    | 14.805              | 542.92               | 27.270                | 1355.75           | 0.01092            |
| APPROACH                           | 0.300               | 13050.0       | 49.651                    | 5789.273              | 1.000              | 4.00                    | 3.310               | 385.95               | 8.576                 | 870.00            | 0.00380            |
| TAXI-IDLE                          | 0.070               | 3045.0        | 3.297                     | 1971.791              | 1.000              | 7.00                    | 0.385               | 230.04               | 1.672                 | 355.25            | 0.00108            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 26.257              | 1985.45              |                       | 4052.75           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 13.225              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.479               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 154.317             |                      |                       |                   |                    |

DATE: 7/28/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 323 ENGINE TYPE AND MODEL: JT9D-7 SERIAL NUMBER: P-685605

RATED THRUST: 49500.

ENGINE TOTAL TIME: -0. MRS

TIME SINCE HOT SECTION OVERHAUL: -0. MRS

TIME SINCE:

M1 COMPRESSOR OVERHAUL: -0. MRS

M2 COMPRESSOR OVERHAUL: -0. MRS

COMBUSTOR CAN REPLACEMENT: -0. MRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. MRS

M1 TURBINE OVERHAUL: -0. MRS

M2 TURBINE OVERHAUL: -0. MRS

FUEL: JP-4 FUEL M/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 72.80 FINISH 77.00

ATMOSPHERIC PRESSURE: START 28.60 FINISH 28.60

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0091

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 15

COMMENTS:

BURNER CONFIGURATION - 10

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | M1      | M2       | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|---------|----------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1031.00    | 1/ 0      | 3373.00            | 7                        | 1016.00          | 4991.00 | 1719.00  | -0.00                    | 0.010000                | -0.00    | 1.02                                | -0.00                     |                              |
| 1041.00    | 2/ 1      | 3954.00            | 8                        | 1099.00          | 5187.00 | 1884.00  | -0.00                    | 0.010000                | -0.00    | 1.02                                | -0.00                     |                              |
| 1051.00    | 3/ 2      | 4368.00            | 9                        | 1156.00          | 5317.00 | 2010.00  | -0.00                    | 0.010000                | -0.00    | 1.02                                | -0.00                     |                              |
| 1104.00    | 4/ 3      | 49955.00           | 100                      | 3334.00          | 7434.00 | 16571.00 | -0.00                    | 0.023000                | -0.00    | 1.46                                | -0.00                     |                              |
| 1112.00    | 5/ 4      | 43794.00           | 96                       | 3270.00          | 7401.00 | 15604.00 | -0.00                    | 0.022000                | -0.00    | 1.42                                | -0.00                     |                              |
| 1119.00    | 6/ 5      | 42510.00           | 93                       | 3235.00          | 7382.00 | 15081.00 | -0.00                    | 0.022000                | -0.00    | 1.40                                | -0.00                     |                              |
| 1126.00    | 7/ 6      | 40841.00           | 89                       | 3182.00          | 7349.00 | 14356.00 | -0.00                    | 0.021000                | -0.00    | 1.38                                | -0.00                     |                              |
| 1133.00    | 8/ 7      | 29597.00           | 65                       | 3143.00          | 7325.00 | 13846.00 | -0.00                    | 0.021000                | -0.00    | 1.36                                | -0.00                     |                              |
| 1140.00    | 9/ 8      | 37742.00           | 82                       | 3092.00          | 7289.00 | 13132.00 | -0.00                    | 0.020000                | -0.00    | 1.34                                | -0.00                     |                              |
| 1147.00    | 10/ 9     | 36453.00           | 80                       | 3047.00          | 7253.00 | 12588.00 | -0.00                    | 0.020000                | -0.00    | 1.32                                | -0.00                     |                              |
| 1154.00    | 11/10     | 34632.00           | 76                       | 2991.00          | 7216.00 | 11910.00 | -0.00                    | 0.019000                | -0.00    | 1.30                                | -0.00                     |                              |
| 1201.00    | 12/11     | 33576.00           | 73                       | 2955.00          | 7180.00 | 11492.00 | -0.00                    | 0.019000                | -0.00    | 1.28                                | -0.00                     |                              |
| 1208.00    | 13/12     | 32008.00           | 70                       | 2899.00          | 7149.00 | 10896.00 | -0.00                    | 0.018000                | -0.00    | 1.26                                | -0.00                     |                              |
| 1215.00    | 14/13     | 30445.00           | 66                       | 2840.00          | 7102.00 | 10291.00 | -0.00                    | 0.018000                | -0.00    | 1.25                                | -0.00                     |                              |
| 1222.00    | 15/14     | 29146.00           | 64                       | 2788.00          | 7058.00 | 9789.00  | -0.00                    | 0.018000                | -0.00    | 1.23                                | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 7                        | 643.00                     | -0.00                     | 454.10        | 1.67                 | 180.70         | 15.90         | 0.0             | 15.90           | -0.00     | -0.00 | -0.00        |
| 8                        | 648.00                     | -0.00                     | 377.97        | 1.67                 | 122.80         | 16.10         | 0.0             | 16.10           | -0.00     | -0.00 | -0.00        |
| 9                        | 654.00                     | -0.00                     | 308.80        | 1.69                 | 85.20          | 15.30         | 3.60            | 29.40           | -0.00     | -0.00 | -0.00        |
| 100                      | 1052.00                    | -0.00                     | 7.50          | 3.50                 | 5.90           | 376.00        | 19.30           | 395.30          | -0.00     | -0.00 | -0.00        |
| 96                       | 1027.00                    | -0.00                     | 4.30          | 3.37                 | 2.90           | 369.30        | 19.80           | 389.10          | -0.00     | -0.00 | -0.00        |
| 93                       | 1014.00                    | -0.00                     | 3.10          | 3.58                 | 5.60           | 324.70        | 19.60           | 344.30          | -0.00     | -0.00 | -0.00        |
| 89                       | 995.00                     | -0.00                     | 4.00          | 3.50                 | 4.80           | 314.50        | 18.90           | 333.40          | -0.00     | -0.00 | -0.00        |
| 65                       | 982.00                     | -0.00                     | 6.50          | 3.45                 | 4.20           | 290.80        | 16.20           | 307.00          | -0.00     | -0.00 | -0.00        |
| 82                       | 967.00                     | -0.00                     | 6.10          | 3.41                 | 4.30           | 262.60        | 15.60           | 278.20          | -0.00     | -0.00 | -0.00        |
| 80                       | 953.00                     | -0.00                     | 23.20         | 3.31                 | 0.0            | 242.20        | 37.90           | 280.10          | -0.00     | -0.00 | -0.00        |
| 76                       | 936.00                     | -0.00                     | 22.60         | 3.20                 | 0.50           | 221.30        | 27.50           | 248.80          | -0.00     | -0.00 | -0.00        |
| 73                       | 923.00                     | -0.00                     | 27.90         | 3.08                 | 1.60           | 201.60        | 19.00           | 220.60          | -0.00     | -0.00 | -0.00        |
| 70                       | 910.00                     | -0.00                     | 27.30         | 3.02                 | 2.70           | 184.50        | 26.50           | 211.00          | -0.00     | -0.00 | -0.00        |
| 66                       | 894.00                     | -0.00                     | 29.20         | 2.95                 | 25.70          | 414.00        | 24.70           | 438.70          | -0.00     | -0.00 | -0.00        |
| 64                       | 880.00                     | -0.00                     | 31.50         | 2.87                 | 20.70          | 368.00        | 25.20           | 392.20          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 7                        | 52.31                     | 11.92                     | 0.0                        | 3022.84                    | 3.01                      | 3.01                       | 89.93             | 20.49             | 0.0                | 5196.26            | 5.17              | 5.17               |
| 8                        | 43.87                     | 8.17                      | 0.0                        | 3046.41                    | 3.07                      | 3.07                       | 82.66             | 15.78             | 0.0                | 5739.43            | 5.78              | 5.78               |
| 9                        | 35.66                     | 5.63                      | 0.68                       | 3066.26                    | 2.90                      | 5.58                       | 71.67             | 11.33             | 1.37               | 6163.18            | 5.83              | 11.21              |
| 100                      | 0.43                      | 0.19                      | 1.81                       | 3136.54                    | 35.23                     | 37.03                      | 7.09              | 3.19              | 29.96              | 51975.66           | 583.72            | 613.68             |
| 96                       | 0.25                      | 0.10                      | 1.93                       | 3137.07                    | 35.94                     | 37.86                      | 3.98              | 1.54              | 30.07              | 48950.89           | 560.78            | 590.85             |
| 93                       | 0.17                      | 0.18                      | 1.80                       | 3136.98                    | 29.74                     | 31.54                      | 2.61              | 2.70              | 27.08              | 47308.82           | 448.56            | 475.64             |
| 89                       | 0.23                      | 0.16                      | 1.77                       | 3136.96                    | 29.47                     | 31.24                      | 3.28              | 2.25              | 25.42              | 45034.14           | 423.03            | 448.46             |
| 65                       | 0.38                      | 0.14                      | 1.54                       | 3136.77                    | 27.64                     | 29.18                      | 5.21              | 1.93              | 21.32              | 43431.74           | 382.70            | 404.03             |
| 82                       | 0.36                      | 0.14                      | 1.50                       | 3136.79                    | 25.25                     | 26.75                      | 4.69              | 1.89              | 19.70              | 41192.30           | 331.67            | 351.32             |
| 80                       | 1.40                      | 0.0                       | 3.75                       | 3135.55                    | 23.99                     | 27.74                      | 17.61             | 0.0               | 47.25              | 39470.25           | 301.92            | 349.17             |
| 76                       | 1.41                      | 0.02                      | 2.87                       | 3135.48                    | 22.67                     | 25.49                      | 16.79             | 0.21              | 33.55              | 37343.58           | 269.98            | 303.53             |
| 73                       | 1.81                      | 0.06                      | 2.02                       | 3134.74                    | 21.45                     | 23.47                      | 20.77             | 0.68              | 23.23              | 36024.46           | 246.50            | 269.73             |
| 70                       | 1.80                      | 0.10                      | 2.88                       | 3134.63                    | 20.02                     | 22.90                      | 19.65             | 1.11              | 31.33              | 34154.91           | 218.13            | 249.47             |
| 66                       | 1.97                      | 0.99                      | 2.74                       | 3131.92                    | 45.95                     | 48.69                      | 20.30             | 10.23             | 28.21              | 32230.55           | 472.85            | 501.07             |
| 64                       | 2.19                      | 0.80                      | 2.87                       | 3132.10                    | 41.98                     | 44.74                      | 21.42             | 7.87              | 28.14              | 30660.14           | 410.98            | 438.01             |

| POWER PERCENT RATED T.O. | CO LB/1K0TH-HR | CO 2 LB/1K0TH-HR | THC LB/1K0TH-HR | NO LB/1K0TH-HR | NO 2 LB/1K0TH-HR | NO X LB/1K0TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 7                        | 26.661         | 1540.546         | 6.076           | 1.533          | 0.0              | 1.533            |
| 8                        | 20.905         | 1451.551         | 3.891           | 1.463          | 0.0              | 1.463            |
| 9                        | 16.409         | 1410.984         | 2.593           | 1.335          | 0.314            | 2.566            |
| 100                      | 0.154          | 1131.012         | 0.069           | 12.702         | 0.652            | 13.354           |
| 96                       | 0.091          | 1117.754         | 0.035           | 12.805         | 0.607            | 13.491           |
| 93                       | 0.061          | 1112.887         | 0.063           | 10.552         | 0.637            | 11.189           |
| 89                       | 0.080          | 1102.670         | 0.055           | 10.338         | 0.622            | 10.981           |
| 65                       | 0.176          | 1467.438         | 0.065           | 12.931         | 0.720            | 13.651           |
| 82                       | 0.124          | 1091.418         | 0.050           | 8.786          | 0.522            | 9.308            |
| 80                       | 0.483          | 1082.771         | 0.0             | 8.283          | 1.296            | 9.579            |
| 76                       | 0.485          | 1078.297         | 0.006           | 7.796          | 0.969            | 8.764            |
| 73                       | 0.619          | 1072.923         | 0.020           | 7.347          | 0.692            | 8.034            |
| 70                       | 0.614          | 1067.075         | 0.035           | 6.815          | 0.979            | 7.794            |
| 66                       | 0.667          | 1058.649         | 0.336           | 15.931         | 0.927            | 16.458           |
| 64                       | 0.735          | 1051.950         | 0.270           | 14.101         | 0.966            | 15.028           |

CAL ID NUMBER: 323 ENGINE TYPE AND MODEL: JT9D-7 SERIAL NUMBER: P-685605  
TEST ORGANIZATION: PRATT & WHITNEY

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3185.0        | 77.165                    | 1403.093              | 1.000              | 19.00                   | 24.436             | 444.31               | 54.996                | 1008.58           | 0.02423            |
| TAKEOFF                            | 1.000               | 45500.0       | 3.611                     | 16342.047             | 1.000              | 0.70                    | 0.042              | 190.66               | 0.221                 | 530.83            | 0.00008            |
| CLIMBOUT                           | 0.850               | 38675.0       | 15.273                    | 13736.523             | 1.000              | 2.20                    | 0.560              | 503.67               | 1.112                 | 1418.08           | 0.00039            |
| APPROACH                           | 0.300               | 13650.0       | 32.866                    | 4643.387              | 1.000              | 4.00                    | 2.191              | 309.56               | 7.078                 | 910.00            | 0.00241            |
| TAXI-IDLE                          | 0.070               | 3185.0        | 77.165                    | 1403.093              | 1.000              | 7.00                    | 9.003              | 163.69               | 54.996                | 371.58            | 0.02423            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 36.231             | 1611.89              |                       | 4239.08           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 22.477             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.547              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.093              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3185.0        | 16.747                    | 1403.093              | 1.000              | 19.00                   | 5.303              | 444.31               | 11.936                | 1008.58           | 0.00526            |
| TAKEOFF                            | 1.000               | 45500.0       | 3.992                     | 16342.047             | 1.000              | 0.70                    | 0.047              | 190.66               | 0.244                 | 530.83            | 0.00009            |
| CLIMBOUT                           | 0.850               | 38675.0       | 3.085                     | 13736.523             | 1.000              | 2.20                    | 0.113              | 503.67               | 0.225                 | 1418.08           | 0.00008            |
| APPROACH                           | 0.300               | 13650.0       | 2.709                     | 4643.387              | 1.000              | 4.00                    | 0.181              | 309.56               | 0.583                 | 910.00            | 0.00020            |
| TAXI-IDLE                          | 0.070               | 3185.0        | 16.747                    | 1403.093              | 1.000              | 7.00                    | 1.954              | 163.69               | 11.936                | 371.58            | 0.00526            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 7.597              | 1611.89              |                       | 4239.08           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 4.713              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 1.792              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.024              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3185.0        | 4.532                     | 1403.093              | 1.000              | 19.00                   | 1.435               | 444.31               | 3.230                 | 1008.58           | 0.00142            |
| TAKEOFF                            | 1.000               | 45500.0       | 603.415                   | 16342.047             | 1.000              | 0.70                    | 7.040               | 190.66               | 36.924                | 530.83            | 0.01326            |
| CLIMBOUT                           | 0.850               | 38675.0       | 402.453                   | 13736.523             | 1.000              | 2.20                    | 14.757              | 503.67               | 29.298                | 1418.08           | 0.01041            |
| APPROACH                           | 0.300               | 13650.0       | 44.881                    | 4643.387              | 1.000              | 4.00                    | 2.992               | 309.56               | 9.666                 | 910.00            | 0.00329            |
| TAXI-IDLE                          | 0.070               | 3185.0        | 4.532                     | 1403.093              | 1.000              | 7.00                    | 0.529               | 163.69               | 3.230                 | 371.58            | 0.00142            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 26.752              | 1611.89              |                       | 4239.08           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.597              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 6.311               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 154.722             |                      |                       |                   |                    |

DATE: 7/28/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 324 ENGINE TYPE AND MODEL: JT9D-7 SERIAL NUMBER: P-685602

RATED THRUST: 45500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL W/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 79.90

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.85

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0082

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

BUPNR CONFIGURATION - 10

| CLOCK TIME | TEST MODF | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGRFFS F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1609.00    | 1/ 0      | 45787.00           | 100                      | 3341.00          | 7478.00                  | 16549.00                | -0.00    | 0.023000                            | -0.00                     | 1.45                         |
| 1616.00    | 2/ 1      | 42070.00           | 92                       | 3233.00          | 7411.00                  | 14921.00                | -0.00    | 0.022000                            | -0.00                     | 1.40                         |
| 1623.00    | 3/ 2      | 39345.00           | 86                       | 3152.00          | 7349.00                  | 13827.00                | -0.00    | 0.021000                            | -0.00                     | 1.36                         |
| 1630.00    | 4/ 3      | 35544.00           | 78                       | 3036.00          | 7260.00                  | 12307.00                | -0.00    | 0.020000                            | -0.00                     | 1.31                         |
| 1637.00    | 5/ 4      | 30448.00           | 66                       | 2853.00          | 7125.00                  | 10347.00                | -0.00    | 0.018000                            | -0.00                     | 1.25                         |
| 1639.00    | 6/ 5      | 3207.00            | 7                        | 1000.00          | 5017.00                  | 1595.00                 | -0.00    | 0.010000                            | -0.00                     | 1.02                         |
| 1648.00    | 7/ 6      | 3570.00            | 7                        | 1056.00          | 5163.00                  | 1797.00                 | -0.00    | 0.010000                            | -0.00                     | 1.02                         |
| 1653.00    | 8/ 7      | 4009.00            | 8                        | 1117.00          | 5281.00                  | 1926.00                 | -0.00    | 0.010000                            | -0.00                     | 1.02                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKF | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 100                      | 1080.00                    | -0.00                     | 7.30          | 3.92                 | 8.80           | 442.70        | 26.40           | 469.10          | -0.00     | -0.00 | -0.00        |
| 92                       | 1038.00                    | -0.00                     | 6.50          | 3.72                 | 18.10          | 377.90        | 23.80           | 401.70          | -0.00     | -0.00 | -0.00        |
| 86                       | 1009.00                    | -0.00                     | 6.10          | 3.57                 | 13.30          | 319.90        | 19.70           | 339.60          | -0.00     | -0.00 | -0.00        |
| 78                       | 970.00                     | -0.00                     | 5.70          | 3.35                 | 9.50           | 256.10        | 16.70           | 272.80          | -0.00     | -0.00 | -0.00        |
| 66                       | 916.00                     | -0.00                     | 6.40          | 3.10                 | 7.40           | 0.0           | 13.80           | 13.80           | -0.00     | -0.00 | -0.00        |
| 7                        | 730.00                     | -0.00                     | 410.60        | 1.60                 | 152.60         | 10.40         | 15.00           | 45.40           | -0.00     | -0.00 | -0.00        |
| 7                        | 679.00                     | -0.00                     | 351.20        | 1.63                 | 114.70         | 11.50         | 16.30           | 27.80           | -0.00     | -0.00 | -0.00        |
| 8                        | 682.00                     | -0.00                     | 314.60        | 1.67                 | 92.80          | 12.60         | 17.10           | 29.70           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 100                      | 0.37                      | 0.76                      | 2.21                       | 3136.46                    | 37.03                     | 39.24                      | 6.15              | 4.25              | 36.54              | 51905.22           | 612.80            | 649.34             |
| 92                       | 0.35                      | 0.56                      | 2.10                       | 3135.67                    | 33.10                     | 35.40                      | 5.20              | 8.30              | 31.29              | 44787.35           | 496.87            | 528.16             |
| 86                       | 0.34                      | 0.43                      | 1.81                       | 3136.04                    | 29.38                     | 31.19                      | 4.72              | 5.89              | 25.01              | 43362.03           | 406.20            | 431.21             |
| 78                       | 0.34                      | 0.32                      | 1.63                       | 3136.32                    | 25.06                     | 26.70                      | 4.18              | 3.94              | 20.12              | 38598.70           | 308.47            | 328.59             |
| 66                       | 0.41                      | 0.27                      | 1.46                       | 3136.35                    | 0.0                       | 1.46                       | 4.26              | 2.82              | 15.10              | 32451.80           | 0.0               | 15.10              |
| 7                        | 49.51                     | 10.54                     | 2.97                       | 3031.05                    | 2.04                      | 8.99                       | 78.96             | 16.81             | 4.74               | 4834.52            | 3.29              | 14.34              |
| 7                        | 41.83                     | 7.82                      | 3.19                       | 3050.55                    | 2.25                      | 5.44                       | 75.17             | 14.06             | 5.73               | 5481.84            | 4.04              | 9.77               |
| 8                        | 36.72                     | 6.20                      | 1.28                       | 3063.02                    | 2.42                      | 5.69                       | 70.73             | 11.95             | 6.31               | 5899.38            | 4.65              | 10.97              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 100                      | 0.134          | 1133.624         | 0.093           | 13.384         | 0.798            | 14.182           |
| 92                       | 0.124          | 1112.131         | 0.197           | 11.811         | 0.744            | 12.554           |
| 86                       | 0.120          | 1172.098         | 0.150           | 10.324         | 0.636            | 10.960           |
| 78                       | 0.118          | 1095.942         | 0.112           | 8.679          | 0.566            | 9.245            |
| 66                       | 0.140          | 1065.811         | 0.093           | 0.0            | 0.496            | 0.496            |
| 7                        | 24.622         | 1507.491         | 5.241           | 1.024          | 1.477            | 4.472            |
| 7                        | 21.057         | 1535.531         | 3.939           | 1.133          | 1.605            | 2.738            |
| 8                        | 17.643         | 1471.534         | 2.991           | 1.161          | 1.575            | 2.736            |

CAL ID NUMBER: 324 ENGINE TYPE AND MODEL: JT9D-7  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P-685602

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 83.413                    | 1633.519              | 1.000              | 19.00                   | 26.414             | 517.28               | 51.064                | 1008.58           | 0.02619            |
| TAKEOFF   | 1.000               | 45500.0       | 8.074                     | 16478.223             | 1.000              | 0.70                    | 0.094              | 192.25               | 0.490                 | 530.83            | 0.00018            |
| CLIMBOUT  | 0.850               | 38675.0       | 6.686                     | 13645.398             | 1.000              | 2.20                    | 0.245              | 500.33               | 0.490                 | 1418.08           | 0.00017            |
| APPROACH  | 0.300               | 13650.0       | 21.469                    | 4951.391              | 1.000              | 4.00                    | 1.431              | 330.09               | 4.336                 | 910.00            | 0.00157            |
| TAXI-IDLE | 0.070               | 3185.0        | 83.413                    | 1633.519              | 1.000              | 7.00                    | 9.732              | 190.58               | 51.064                | 371.58            | 0.02619            |

TOTAL FOR CYCLE: 37.916 1730.53 4239.08  
LBS POLLUTANT/1K LB FUEL/CYCLE: 21.910  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.944  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.207

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 17.412                    | 1633.519              | 1.000              | 19.00                   | 5.514              | 517.28               | 10.659                | 1008.58           | 0.00547            |
| TAKEOFF   | 1.000               | 45500.0       | 4.900                     | 16478.223             | 1.000              | 0.70                    | 0.057              | 192.25               | 0.297                 | 530.83            | 0.00011            |
| CLIMBOUT  | 0.850               | 38675.0       | 4.781                     | 13645.398             | 1.000              | 2.20                    | 0.175              | 500.33               | 0.350                 | 1418.08           | 0.00012            |
| APPROACH  | 0.300               | 13650.0       | 3.104                     | 4951.391              | 1.000              | 4.00                    | 0.207              | 330.09               | 0.627                 | 910.00            | 0.00023            |
| TAXI-IDLE | 0.070               | 3185.0        | 17.412                    | 1633.519              | 1.000              | 7.00                    | 2.031              | 190.58               | 10.659                | 371.58            | 0.00547            |

TOTAL FOR CYCLE: 7.984 1730.53 4239.08  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.614  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.884  
LBS POLLUTANT/1000K LB TH AT T.O.: 1.256

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 8.688                     | 1633.519              | 1.000              | 19.00                   | 2.751               | 517.28               | 5.319                 | 1008.58           | 0.00273            |
| TAKEOFF   | 1.000               | 45500.0       | 654.127                   | 16478.223             | 1.000              | 0.70                    | 7.631               | 192.25               | 39.696                | 530.83            | 0.01438            |
| CLIMBOUT  | 0.850               | 38675.0       | 414.190                   | 13645.398             | 1.000              | 2.20                    | 15.187              | 500.33               | 30.354                | 1418.08           | 0.01071            |
| APPROACH  | 0.300               | 13650.0       | 57.925                    | 4951.391              | 1.000              | 4.00                    | 3.862               | 330.09               | 11.699                | 910.00            | 0.00424            |
| TAXI-IDLE | 0.070               | 3185.0        | 8.688                     | 1633.519              | 1.000              | 7.00                    | 1.014               | 190.58               | 5.319                 | 371.58            | 0.00273            |

TOTAL FOR CYCLE: 30.445 1730.53 4239.08  
LBS POLLUTANT/1K LB FUEL/CYCLE: 17.593  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.182  
LBS POLLUTANT/1000K LB TH AT T.O.: 167.725

DATE: 7/29/71

TEST ORGANIZATION: PRATT &amp; WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 325 ENGINE TYPE AND MODEL: JT9D-7

SERIAL NUMBER: P-663071

RATED THRUST: 45500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
 N2 COMPRESSOR OVERHAUL: -0. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
 N1 TURBINE OVERHAUL: -0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-4

FUEL H/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.70 FINISH 75.60

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.85

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0154

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 8

COMMENTS:

BURNER CONFIGURATION - 10

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2       | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|----------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1303.00    | 1/ 0      | 2626.00                  | 5                  | 918.00           | 4860.00 | 1555.00  | -0.00                    | 0.010000                | -0.00    | 1.01                                | -0.00                     |                              |
| 1329.00    | 2/ 1      | 3205.00                  | 7                  | 1015.00          | 5093.00 | 1707.00  | -0.00                    | 0.009000                | -0.00    | 1.02                                | -0.00                     |                              |
| 1338.00    | 3/ 2      | 3595.00                  | 7                  | 1071.00          | 5214.00 | 1811.00  | -0.00                    | 0.009000                | -0.00    | 1.02                                | -0.00                     |                              |
| 1352.00    | 4/ 3      | 4366.00                  | 95                 | 3290.00          | 7558.00 | 15364.00 | -0.00                    | 0.021000                | -0.00    | 1.43                                | -0.00                     |                              |
| 1413.00    | 5/ 4      | 32549.00                 | 71                 | 2939.00          | 7325.00 | 10998.00 | -0.00                    | 0.017000                | -0.00    | 1.28                                | -0.00                     |                              |
| 1947.00    | 6/ 5      | 30066.00                 | 66                 | 2828.00          | 7189.00 | 9912.00  | -0.00                    | 0.016000                | -0.00    | 1.24                                | -0.00                     |                              |
| 2007.00    | 7/ 6      | 36393.00                 | 79                 | 3053.00          | 7395.00 | 12323.00 | -0.00                    | 0.018000                | -0.00    | 1.32                                | -0.00                     |                              |
| 2020.00    | 8/ 7      | 39943.00                 | 87                 | 3165.00          | 7490.00 | 13712.00 | -0.00                    | 0.019000                | -0.00    | 1.37                                | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 677.00                     | -0.00                     | 572.70        | 1.74                 | 401.90         | 9.60          | 7.20            | 16.80           | -0.00     | -0.00 | -0.00        |
| 7                        | 671.00                     | -0.00                     | 473.70        | 1.73                 | 280.10         | 9.10          | 10.60           | 19.70           | -0.00     | -0.00 | -0.00        |
| 7                        | 668.00                     | -0.00                     | 429.90        | 1.75                 | 226.50         | 8.80          | 12.90           | 21.70           | -0.00     | -0.00 | -0.00        |
| 95                       | 1052.00                    | -0.00                     | 12.00         | 3.97                 | 5.20           | 265.60        | 17.30           | 282.90          | -0.00     | -0.00 | -0.00        |
| 71                       | 932.00                     | -0.00                     | 18.10         | 3.40                 | 4.10           | 209.10        | 16.70           | 225.80          | -0.00     | -0.00 | -0.00        |
| 66                       | 887.00                     | -0.00                     | 21.20         | 2.80                 | 2.10           | 167.30        | 6.20            | 273.50          | -0.00     | -0.00 | -0.00        |
| 79                       | 956.00                     | -0.00                     | 16.10         | 3.32                 | 0.80           | 204.90        | 14.60           | 219.50          | -0.00     | -0.00 | -0.00        |
| 87                       | 1003.00                    | -0.00                     | 12.20         | 3.51                 | 1.20           | 219.20        | 15.40           | 234.60          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 62.24                     | 25.02                     | 1.29                       | 2971.32                    | 1.71                      | 3.00                       | 96.79             | 38.90             | 2.00               | 4620.39            | 2.66              | 4.66               |
| 7                        | 52.40                     | 17.74                     | 1.93                       | 3006.73                    | 1.65                      | 3.58                       | 89.44             | 30.29             | 3.29               | 5132.49            | 2.92              | 6.11               |
| 7                        | 47.28                     | 14.27                     | 2.33                       | 3024.31                    | 1.59                      | 3.92                       | 85.63             | 25.84             | 4.22               | 5477.02            | 2.88              | 7.10               |
| 95                       | 0.60                      | 0.15                      | 1.43                       | 3136.39                    | 21.94                     | 23.36                      | 9.27              | 2.30              | 21.95              | 48187.43           | 337.02            | 358.97             |
| 71                       | 1.06                      | 0.14                      | 1.61                       | 3135.70                    | 20.16                     | 21.77                      | 11.68             | 1.52              | 17.71              | 34486.40           | 221.72            | 239.43             |
| 66                       | 1.51                      | 0.09                      | 0.73                       | 3135.14                    | 19.58                     | 32.01                      | 14.97             | 0.85              | 7.19               | 31075.46           | 194.11            | 317.32             |
| 79                       | 0.97                      | 0.03                      | 1.44                       | 3136.15                    | 20.23                     | 21.68                      | 11.93             | 0.34              | 17.77              | 38666.75           | 249.34            | 267.11             |
| 87                       | 0.69                      | 0.04                      | 1.44                       | 3136.55                    | 20.48                     | 21.92                      | 9.51              | 0.54              | 19.73              | 43008.33           | 280.78            | 300.51             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 36.857         | 1759.480         | 14.814          | 1.015          | 0.761            | 1.776            |
| 7                        | 27.907         | 1601.402         | 9.451           | 0.881          | 1.026            | 1.906            |
| 7                        | 23.820         | 1523.509         | 7.188           | 0.801          | 1.174            | 1.975            |
| 95                       | 0.212          | 1103.799         | 0.053           | 7.720          | 0.503            | 8.223            |
| 71                       | 0.358          | 1057.898         | 0.047           | 6.801          | 0.543            | 7.345            |
| 66                       | 0.498          | 1033.575         | 0.028           | 6.456          | 0.239            | 10.554           |
| 79                       | 0.328          | 1061.928         | 0.009           | 6.851          | 0.488            | 7.340            |
| 87                       | 0.238          | 1076.743         | 0.013           | 7.030          | 0.494            | 7.523            |

CAL 10 NUMBER: 325 ENGINE TYPE AND MODEL: JT9D-7

SERIAL NUMBER: P-663071

TEST ORGANIZATION: PRATT & WHITNEY

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3185.0        | 98.475                    | 1824.762              | 1.000              | 19.00                   | 31.184             | 577.84               | 53.966                | 1008.58           | 0.03092            |
| TAKEOFF                            | 1.000               | 45500.0       | 12.982                    | 16079.000             | 1.000              | 0.70                    | 0.151              | 187.59               | 0.807                 | 530.83            | 0.00029            |
| CLIMBOUT                           | 0.850               | 38675.0       | 13.323                    | 13221.047             | 1.000              | 2.20                    | 0.489              | 484.77               | 1.008                 | 1418.08           | 0.00034            |
| APPROACH                           | 0.300               | 13650.0       | 36.413                    | 4969.230              | 1.000              | 4.00                    | 2.428              | 331.28               | 7.328                 | 910.00            | 0.00267            |
| TAXI-IDLE                          | 0.070               | 3185.0        | 98.475                    | 1824.762              | 1.000              | 7.00                    | 11.489             | 212.89               | 53.966                | 371.58            | 0.03092            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 45.740             | 1794.37              |                       | 4239.08           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 25.491             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 10.790             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.333              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3185.0        | 31.437                    | 1824.762              | 1.000              | 19.00                   | 9.955              | 577.84               | 17.228                | 1008.58           | 0.00987            |
| TAKEOFF                            | 1.000               | 45500.0       | 0.0                       | 16079.000             | 1.000              | 0.70                    | 0.0                | 187.59               | 0.0                   | 530.83            | 0.0                |
| CLIMBOUT                           | 0.850               | 38675.0       | 0.404                     | 13221.047             | 1.000              | 2.20                    | 0.015              | 484.77               | 0.031                 | 1418.08           | 0.00001            |
| APPROACH                           | 0.300               | 13650.0       | 3.708                     | 4969.230              | 1.000              | 4.00                    | 0.247              | 331.28               | 0.746                 | 910.00            | 0.00027            |
| TAXI-IDLE                          | 0.070               | 3185.0        | 31.437                    | 1824.762              | 1.000              | 7.00                    | 3.668              | 212.89               | 17.228                | 371.58            | 0.00987            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 13.885             | 1794.37              |                       | 4239.08           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 7.738              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 3.275              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.070               | 3185.0        | 9.403                     | 1824.762              | 1.000              | 19.00                   | 2.978               | 577.84               | 5.153                 | 1008.58           | 0.00295            |
| TAKEOFF                            | 1.000               | 45500.0       | 578.542                   | 16079.000             | 1.000              | 0.70                    | 6.750               | 187.59               | 35.981                | 530.83            | 0.01272            |
| CLIMBOUT                           | 0.850               | 38675.0       | 402.485                   | 13221.047             | 1.000              | 2.20                    | 14.758              | 484.77               | 30.443                | 1418.08           | 0.01041            |
| APPROACH                           | 0.300               | 13650.0       | 61.486                    | 4969.230              | 1.000              | 4.00                    | 4.099               | 331.28               | 12.373                | 910.00            | 0.00450            |
| TAXI-IDLE                          | 0.070               | 3185.0        | 9.403                     | 1824.762              | 1.000              | 7.00                    | 1.097               | 212.89               | 5.153                 | 371.58            | 0.00295            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 29.681              | 1794.37              |                       | 4239.08           |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 16.541              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 7.002               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 148.344             |                      |                       |                   |                    |

DATE: 8/ 5/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA .....

CAL ID NUMBER: 326 ENGINE TYPE AND MODEL: JT9D-7 SERIAL NUMBER: P685614  
RATED THRUST: 45500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL W/C RATIO: 2.000

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 74.90

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.82

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0074

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

BURNER CONFIGURATION - R/M

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OW<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 | ENGINE<br>SPEED<br>RPM<br>N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SFC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------------|------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 1611.00       | 1/ 0         | 4559.00                           | 10                       | 1276.00                      | 5549.00                      | 2271.00                           | -0.00                         | 0.010000    | -0.00                                        | 1.03                               | -0.00                                 |
| 1624.00       | 2/ 1         | 34868.00                          | 76                       | 3131.00                      | 7316.00                      | 13605.00                          | -0.00                         | 0.020000    | -0.00                                        | 1.36                               | -0.00                                 |
| 1637.00       | 3/ 2         | 41250.00                          | 90                       | 3271.00                      | 7620.00                      | 16411.00                          | -0.00                         | 0.022000    | -0.00                                        | 1.46                               | -0.00                                 |
| 1835.00       | 4/ 3         | 4562.00                           | 10                       | 1276.00                      | 5544.00                      | 2273.00                           | -0.00                         | 0.010000    | -0.00                                        | 1.03                               | -0.00                                 |
| 1842.00       | 5/ 4         | 2905.00                           | 6                        | 1023.00                      | 5036.00                      | 1720.00                           | -0.00                         | 0.010000    | -0.00                                        | 1.02                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 10                                | 670.00                              | -0.00                              | 254.20              | 1.71                          | 47.60                | 4.90                | 16.20                    | 21.10                    | -0.00     | -0.00 | -0.00        |
| 76                                | 980.00                              | -0.00                              | 3.40                | 3.39                          | 1.10                 | 272.30              | 17.50                    | 289.80                   | -0.00     | -0.00 | -0.00        |
| 90                                | 1054.00                             | -0.00                              | 3.10                | 3.57                          | 0.40                 | 421.10              | 25.30                    | 446.40                   | -0.00     | -0.00 | -0.00        |
| 10                                | 670.00                              | -0.00                              | 271.00              | 1.65                          | 56.00                | 16.10               | 14.90                    | 31.00                    | -0.00     | -0.00 | -0.00        |
| 6                                 | 659.00                              | -0.00                              | 425.70              | 1.38                          | 141.90               | 0.30                | 4.80                     | 5.10                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 10                                | 29.40                              | 3.13                               | 3.05                                | 3082.97                             | 0.92                               | 3.98                                | 66.76                   | 7.10                    | 6.93                     | 7001.43                  | 2.10                    | 9.03                     |
| 76                                | 0.20                               | 0.04                               | 1.69                                | 3137.33                             | 26.34                              | 28.04                               | 2.72                    | 0.50                    | 23.03                    | 42683.35                 | 358.42                  | 381.45                   |
| 90                                | 0.17                               | 0.01                               | 2.32                                | 3137.44                             | 38.69                              | 41.01                               | 2.85                    | 0.21                    | 38.15                    | 51488.46                 | 634.91                  | 673.05                   |
| 10                                | 32.16                              | 3.81                               | 2.90                                | 3076.77                             | 3.14                               | 6.04                                | 73.10                   | 8.65                    | 6.60                     | 6993.49                  | 7.13                    | 13.74                    |
| 6                                 | 59.17                              | 11.30                              | 1.10                                | 3013.79                             | 0.07                               | 1.16                                | 101.77                  | 19.43                   | 1.88                     | 5183.71                  | 0.12                    | 2.00                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 10                                | 14.644            | 1535.737               | 1.558              | 0.460             | 1.571                  | 1.981                  |
| 76                                | 0.078             | 1224.141               | 0.014              | 10.279            | 0.661                  | 10.940                 |
| 90                                | 0.069             | 1248.206               | 0.005              | 15.392            | 0.925                  | 16.316                 |
| 10                                | 16.025            | 1532.988               | 1.896              | 1.566             | 1.447                  | 3.011                  |
| 6                                 | 35.033            | 1794.410               | 6.688              | 0.041             | 0.649                  | 0.689                  |

CAL ID NUMBER: 326 ENGINE TYPE AND MODEL: JT9D-7  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P685614

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 90.684                    | 1643.798              | 1.000              | 19.00                   | 28.717             | 520.54               | 55.167                | 1008.58           | 0.02847            |
| TAKEOFF   | 1.000               | 45500.0       | 6.516                     | 18075.172             | 1.000              | 0.70                    | 0.076              | 210.88               | 0.361                 | 530.83            | 0.00014            |
| CLIMBOUT  | 0.850               | 38675.0       | 9.465                     | 15166.035             | 1.000              | 2.20                    | 0.347              | 556.09               | 0.624                 | 1418.08           | 0.00024            |
| APPROACH  | 0.300               | 13650.0       | 38.765                    | 5470.563              | 1.000              | 4.00                    | 2.584              | 364.70               | 7.086                 | 910.00            | 0.00284            |
| TAXI-IDLE | 0.070               | 3185.0        | 90.684                    | 1643.798              | 1.000              | 7.00                    | 10.580             | 191.78               | 55.167                | 371.58            | 0.02847            |

TOTAL FOR CYCLE: 42.304 1843.98 4239.08  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 22.942  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 9.979  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.167

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 14.615                    | 1643.798              | 1.000              | 19.00                   | 4.628              | 520.54               | 8.891                 | 1008.58           | 0.00459            |
| TAKEOFF   | 1.000               | 45500.0       | 0.212                     | 18075.172             | 1.000              | 0.70                    | 0.002              | 210.88               | 0.012                 | 530.83            | 0.00000            |
| CLIMBOUT  | 0.850               | 38675.0       | 0.879                     | 15166.035             | 1.000              | 2.20                    | 0.032              | 556.09               | 0.058                 | 1418.08           | 0.00002            |
| APPROACH  | 0.300               | 13650.0       | 2.122                     | 5470.563              | 1.000              | 4.00                    | 0.141              | 364.70               | 0.388                 | 910.00            | 0.00016            |
| TAXI-IDLE | 0.070               | 3185.0        | 14.615                    | 1643.798              | 1.000              | 7.00                    | 1.705              | 191.78               | 8.891                 | 371.58            | 0.00459            |

TOTAL FOR CYCLE: 6.509 1843.98 4239.08  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 3.530  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.536  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.054

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 3.624                     | 1643.798              | 1.000              | 19.00                   | 1.148               | 520.54               | 2.205                 | 1008.58           | 0.00114            |
| TAKEOFF   | 1.000               | 45500.0       | 882.182                   | 18075.172             | 1.000              | 0.70                    | 10.292              | 210.88               | 48.806                | 530.83            | 0.01939            |
| CLIMBOUT  | 0.850               | 38675.0       | 526.113                   | 15166.035             | 1.000              | 2.20                    | 19.291              | 556.09               | 34.690                | 1418.08           | 0.01360            |
| APPROACH  | 0.300               | 13650.0       | 52.943                    | 5470.563              | 1.000              | 4.00                    | 3.530               | 364.70               | 9.678                 | 910.00            | 0.00388            |
| TAXI-IDLE | 0.070               | 3185.0        | 3.624                     | 1643.798              | 1.000              | 7.00                    | 0.423               | 191.78               | 2.205                 | 371.58            | 0.00114            |

TOTAL FOR CYCLE: 34.683 1843.98 4239.08  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 18.809  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 8.182  
 LBS POLLUTANT/1000K LB TH AT T.O.: 226.200

DATE: 8/ 5/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 355 ENGINE TYPE AND MODEL: JT9D-7 SERIAL NUMBER: P685614

RATED THRUST: 45500.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 76.30 FINISH 74.90

ATMOSPHERIC PRESSURE: START 29.87 FINISH 29.87

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0074

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM |         | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                    |                          | N1               | N2      |                          |                         |          |                                     |                           |                              |
| 1612.00    | 1/ 0      | 5325.00            | 11                       | 1276.00          | 5453.00 | 2224.00                  | -0.00                   | 0.008600 | -0.00                               | 1.03                      | -0.00                        |
| 1624.00    | 2/ 1      | 39014.00           | 85                       | 3131.00          | 7220.00 | 13464.00                 | -0.00                   | 0.017000 | -0.00                               | 1.36                      | -0.00                        |
| 1632.00    | 3/ 2      | 45834.00           | 100                      | 3271.00          | 7405.00 | 16252.00                 | -0.00                   | 0.018000 | -0.00                               | 1.46                      | -0.00                        |
| 1030.00    | 4/ 3      | 5330.00            | 11                       | 1276.00          | 5457.00 | 2230.00                  | -0.00                   | 0.008600 | -0.00                               | 1.03                      | -0.00                        |
| 1043.00    | 5/ 4      | 3397.00            | 7                        | 1023.00          | 4959.00 | 1685.00                  | -0.00                   | 0.008600 | -0.00                               | 1.02                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 85                       | 980.00                     | -0.00                     | 3.40          | 3.39                 | 1.10           | 272.30        | 17.50           | 289.80          | -0.00     | -0.00 | -0.00        |
| 100                      | 1054.00                    | -0.00                     | 3.10          | 3.57                 | 0.40           | 421.10        | 25.30           | 446.40          | -0.00     | -0.00 | -0.00        |
| 11                       | 670.00                     | -0.00                     | 271.00        | 1.65                 | 56.00          | 16.10         | 14.90           | 31.00           | -0.00     | -0.00 | -0.00        |
| 7                        | 659.00                     | -0.00                     | 425.70        | 1.38                 | 141.90         | 0.30          | 7.80            | 5.10            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
|                          |                           |                           |                            |                            |                           |                            |                   |                   |                    |                    |                   |                    |
| 85                       | 0.20                      | 0.04                      | 1.69                       | 3137.33                    | 26.34                     | 29.04                      | 2.70              | 0.50              | 22.80              | 42240.99           | 354.70            | 377.50             |
| 100                      | 0.17                      | 0.01                      | 2.32                       | 3137.44                    | 38.69                     | 41.01                      | 2.82              | 0.21              | 37.78              | 50489.62           | 628.75            | 666.53             |
| 11                       | 32.16                     | 3.81                      | 2.90                       | 3076.77                    | 3.14                      | 6.04                       | 71.72             | 8.49              | 6.48               | 6861.19            | 7.00              | 13.48              |
| 7                        | 59.17                     | 11.30                     | 1.79                       | 3013.79                    | 0.07                      | 1.16                       | 99.70             | 19.03             | 3.00               | 5078.23            | 0.12              | 1.96               |

| POWER PERCENT RATED T.O. | CU LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                          |                |                  |                 |                |                  |                  |
| 85                       | 0.069          | 1082.714         | 0.013           | 9.092          | 0.584            | 9.676            |
| 100                      | 0.061          | 1112.485         | 0.005           | 13.718         | 0.824            | 14.542           |
| 11                       | 13.456         | 1287.277         | 1.593           | 1.313          | 1.215            | 2.528            |
| 7                        | 29.350         | 1494.917         | 5.603           | 0.034          | 0.893            | 0.578            |

CAL ID NUMBER: 355 ENGINE TYPE AND MODEL: JT9D-7  
TEST ORGANIZATION: PRATT & WHITNEY

SERIAL NUMBER: P685614

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 79.733                    | 1530.134              | 1.000              | 19.00                   | 25.249             | 484.54               | 52.109                | 1008.58           | 0.02503            |
| TAKEOFF   | 1.000               | 45500.0       | 1.096                     | 16160.711             | 1.000              | 0.70                    | 0.013              | 188.54               | 0.068                 | 530.83            | 0.00002            |
| CLIMBOUT  | 0.850               | 38675.0       | 9.650                     | 13375.535             | 1.000              | 2.20                    | 0.354              | 490.44               | 0.721                 | 1418.08           | 0.00025            |
| APPROACH  | 0.300               | 13650.0       | 58.261                    | 4443.086              | 1.000              | 4.00                    | 3.884              | 296.21               | 13.113                | 910.00            | 0.00427            |
| TAXI-IDLE | 0.070               | 3185.0        | 79.733                    | 1530.134              | 1.000              | 7.00                    | 9.302              | 178.52               | 52.109                | 371.58            | 0.02503            |

TOTAL FOR CYCLE: 38.802 1638.24 4239.08  
LBS POLLUTANT/1K LB FUEL/CYCLE: 23.685  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 9.153  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.028

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 16.950                    | 1530.134              | 1.000              | 19.00                   | 5.368              | 484.54               | 11.078                | 1008.58           | 0.00532            |
| TAKEOFF   | 1.000               | 45500.0       | 0.970                     | 16160.711             | 1.000              | 0.70                    | 0.011              | 188.54               | 0.060                 | 530.83            | 0.00002            |
| CLIMBOUT  | 0.850               | 38675.0       | 0.803                     | 13375.535             | 1.000              | 2.20                    | 0.029              | 490.44               | 0.060                 | 1418.08           | 0.00002            |
| APPROACH  | 0.300               | 13650.0       | 4.438                     | 4443.086              | 1.000              | 4.00                    | 0.296              | 296.21               | 0.999                 | 910.00            | 0.00033            |
| TAXI-IDLE | 0.070               | 3185.0        | 16.950                    | 1530.134              | 1.000              | 7.00                    | 1.978              | 178.52               | 11.078                | 371.58            | 0.00532            |

TOTAL FOR CYCLE: 7.682 1638.24 4239.08  
LBS POLLUTANT/1K LB FUEL/CYCLE: 4.689  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 1.812  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.249

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.070               | 3185.0        | 4.811                     | 1530.134              | 1.000              | 19.00                   | 1.523               | 484.54               | 3.144                 | 1008.58           | 0.00151            |
| TAKEOFF   | 1.000               | 45500.0       | 641.065                   | 16160.711             | 1.000              | 0.70                    | 7.479               | 188.54               | 39.668                | 530.83            | 0.01409            |
| CLIMBOUT  | 0.850               | 38675.0       | 379.293                   | 13375.535             | 1.000              | 2.20                    | 13.907              | 490.44               | 28.357                | 1418.08           | 0.00981            |
| APPROACH  | 0.300               | 13650.0       | 52.591                    | 4443.086              | 1.000              | 4.00                    | 3.506               | 296.21               | 11.837                | 910.00            | 0.00385            |
| TAXI-IDLE | 0.070               | 3185.0        | 4.811                     | 1530.134              | 1.000              | 7.00                    | 0.561               | 178.52               | 3.144                 | 371.58            | 0.00151            |

TOTAL FOR CYCLE: 26.977 1638.24 4239.08  
LBS POLLUTANT/1K LB FUEL/CYCLE: 16.467  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 6.364  
LBS POLLUTANT/1000K LB TH AT T.O.: 164.376

DATE: 6/10/71

TEST ORGANIZATION: AIRESEARCH

ENGINE SUPPLIER: AIRESEARCH

ENGINE DATA .....

CAL ID NUMBER: 29 ENGINE TYPE AND MODEL: TFE 731-2 SERIAL NUMBER: 7305-2

RATED THRUST: 2800.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: 0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: 0. HRS

FUEL: AV KEROS

FUEL H/C RATIO: 1.928

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 91.00

ATMOSPHERIC PRESSURE: START 28.55 FINISH 28.55

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0036

RELATIVE HUMIDITY: 10.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

| CLOCK TIME | TEST MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 | ENGINE<br>SPEED<br>RPM<br>N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|-----------------------------------|--------------------------|------------------------------|------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| -0.00      | 1/ 0      | 193.00                            | 6                        | 5760.00                      | 16800.00                     | 177.00                            | 4.87                          | 0.010900    | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 2/ 1      | 406.00                            | 14                       | 8470.00                      | 21070.00                     | 285.00                            | 7.58                          | 0.011300    | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 6/ 2      | 1045.00                           | 37                       | 13040.00                     | 25370.00                     | 587.00                            | 14.21                         | 0.012400    | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 11/ 6     | 1637.00                           | 58                       | 15710.00                     | 27020.00                     | 858.00                            | 19.08                         | 0.013500    | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 16/11     | 2222.00                           | 79                       | 17650.00                     | 27960.00                     | 1150.00                           | 23.79                         | 0.014500    | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 20/16     | 2605.00                           | 93                       | 18560.00                     | 28430.00                     | 1330.00                           | 26.60                         | 0.015000    | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 6                                 | 854.00                              | -0.00                              | 463.40              | 2.03                          | 253.80               | 6.20                | 7.70                     | 13.90                    | -0.00     | -0.00 | -0.00        |
| 14                                | 945.00                              | -0.00                              | 263.60              | 2.20                          | 84.70                | 14.50               | 6.50                     | 21.10                    | -0.00     | -0.00 | -0.00        |
| 37                                | 1171.00                             | -0.00                              | 149.30              | 2.60                          | 28.90                | 34.50               | 8.00                     | 42.60                    | -0.00     | -0.00 | -0.00        |
| 58                                | 1329.00                             | -0.00                              | 65.50               | 2.86                          | 3.90                 | 58.00               | 6.80                     | 64.80                    | -0.00     | -0.00 | -0.00        |
| 79                                | 1461.00                             | -0.00                              | 37.70               | 2.93                          | 1.20                 | 84.60               | 5.80                     | 90.40                    | -0.00     | -0.00 | -0.00        |
| 93                                | 1537.00                             | -0.00                              | 24.70               | 3.03                          | 0.80                 | 110.30              | 6.20                     | 116.50                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS FMI<br>CO<br>LB/LK<br>LB FUEL | MASS FMI<br>HC<br>LB/LK<br>LB FUEL | MASS FMI<br>NO2<br>LB/LK<br>LB FUEL | MASS FMI<br>CO2<br>LB/LK<br>LB FUEL | MASS FMI<br>NO<br>LB/LK<br>LB FUEL | MASS FMI<br>NOX<br>LB/LK<br>LB FUEL | MASS FMI<br>CO<br>LB/HR | MASS FMI<br>HC<br>LB/HR | MASS FMI<br>NO2<br>LB/HR | MASS FMI<br>CO2<br>LB/HR | MASS FMI<br>NO<br>LB/HR | MASS FMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 6                                 | 44.26                              | 13.88                              | 1.21                                | 3046.44                             | 0.97                               | 2.18                                | 7.83                    | 2.46                    | 0.21                     | 539.22                   | 0.17                    | 0.39                     |
| 14                                | 23.68                              | 4.36                               | 0.96                                | 3104.91                             | 2.14                               | 3.11                                | 6.75                    | 1.24                    | 0.27                     | 884.90                   | 0.61                    | 0.89                     |
| 37                                | 11.45                              | 1.27                               | 1.01                                | 3132.59                             | 4.35                               | 5.37                                | 6.72                    | 0.75                    | 0.59                     | 1838.83                  | 2.55                    | 3.15                     |
| 58                                | 4.59                               | 0.16                               | 0.78                                | 3146.43                             | 6.67                               | 7.45                                | 3.93                    | 0.13                    | 0.67                     | 2699.64                  | 5.72                    | 6.39                     |
| 79                                | 2.58                               | 0.05                               | 0.65                                | 3149.80                             | 9.51                               | 10.16                               | 2.97                    | 0.05                    | 0.75                     | 3622.36                  | 10.93                   | 11.68                    |
| 93                                | 1.64                               | 0.03                               | 0.67                                | 3151.41                             | 11.99                              | 12.67                               | 2.17                    | 0.04                    | 0.90                     | 4191.38                  | 15.95                   | 16.85                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/LK#TH-HR | CO<br>2<br>LB/LK#TH-HR | THC<br>LB/LK#TH-HR | NO<br>LB/LK#TH-HR | NO<br>2<br>LB/LK#TH-HR | NO<br>X<br>LB/LK#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 6                                 | 40.591            | 2793.881               | 12.732             | 0.892             | 1.108                  | 2.000                  |
| 14                                | 16.621            | 2179.554               | 3.059              | 1.502             | 0.673                  | 2.185                  |
| 37                                | 6.431             | 1759.650               | 0.713              | 2.441             | 0.566                  | 3.014                  |
| 58                                | 2.404             | 1649.137               | 0.087              | 3.496             | 0.410                  | 3.906                  |
| 79                                | 1.335             | 1630.227               | 0.024              | 4.921             | 0.337                  | 5.258                  |
| 93                                | 0.835             | 1608.975               | 0.015              | 6.173             | 0.344                  | 6.467                  |

CAL ID NUMBER: 29 ENGINE TYPE AND MODEL: TFE 731-2  
TEST ORGANIZATION: AIRESEARCH

SERIAL NUMBER: 7305-2

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 168.0         | 8.177                     | 169.623               | 1.000              | 19.00                   | 2.589              | 53.71                | 48.205                | 53.20             | 0.04867            |
| TAKEOFF   | 1.000               | 2800.0        | 1.617                     | 1387.052              | 1.000              | 0.50                    | 0.013              | 11.56                | 1.165                 | 23.33             | 0.00058            |
| CLIMBOUT  | 0.900               | 2520.0        | 2.264                     | 1282.947              | 1.000              | 2.50                    | 0.094              | 53.46                | 1.765                 | 105.00            | 0.00090            |
| APPROACH  | 0.300               | 840.0         | 6.904                     | 477.032               | 1.000              | 4.50                    | 0.518              | 35.78                | 14.473                | 63.00             | 0.00822            |
| TAXI-IDLE | 0.060               | 168.0         | 8.177                     | 169.623               | 1.000              | 7.00                    | 0.954              | 19.79                | 48.205                | 19.60             | 0.04867            |

TOTAL FOR CYCLE: 4.169 174.30 264.13  
LBS POLLUTANT/1K LB FUEL/CYCLE: 23.918  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 15.783  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.481

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 168.0         | 2.600                     | 169.623               | 1.000              | 19.00                   | 0.823              | 53.71                | 15.328                | 53.20             | 0.01548            |
| TAKEOFF   | 1.000               | 2800.0        | 0.039                     | 1387.052              | 1.000              | 0.50                    | 0.000              | 11.56                | 0.043                 | 23.33             | 0.00002            |
| CLIMBOUT  | 0.900               | 2520.0        | 0.087                     | 1282.947              | 1.000              | 2.50                    | 0.004              | 53.46                | 0.068                 | 105.00            | 0.00003            |
| APPROACH  | 0.300               | 840.0         | 0.947                     | 477.032               | 1.000              | 4.50                    | 0.071              | 35.78                | 1.986                 | 63.00             | 0.00113            |
| TAXI-IDLE | 0.060               | 168.0         | 2.600                     | 169.623               | 1.000              | 7.00                    | 0.303              | 19.79                | 15.328                | 19.60             | 0.01548            |

TOTAL FOR CYCLE: 1.202 174.30 264.13  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.895  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.550  
LBS POLLUTANT/1000K LB TH AT T.O.: 0.177

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.060               | 168.0         | 0.320                     | 169.623               | 1.000              | 19.00                   | 0.101               | 53.71                | 1.886                 | 53.20             | 0.00190            |
| TAKEOFF   | 1.000               | 2800.0        | 19.572                    | 1387.052              | 1.000              | 0.50                    | 0.163               | 11.56                | 14.111                | 23.33             | 0.00699            |
| CLIMBOUT  | 0.900               | 2520.0        | 15.576                    | 1282.947              | 1.000              | 2.50                    | 0.649               | 53.46                | 12.141                | 105.00            | 0.00618            |
| APPROACH  | 0.300               | 840.0         | 2.219                     | 477.032               | 1.000              | 4.50                    | 0.166               | 35.78                | 4.652                 | 63.00             | 0.00264            |
| TAXI-IDLE | 0.060               | 168.0         | 0.320                     | 169.623               | 1.000              | 7.00                    | 0.037               | 19.79                | 1.886                 | 19.60             | 0.00190            |

TOTAL FOR CYCLE: 1.117 174.30 264.13  
LBS POLLUTANT/1K LB FUEL/CYCLE: 6.410  
LBS POLLUTANT/1K LB TH-HR/CYCLE: 4.230  
LBS POLLUTANT/1000K LB TH AT T.O.: 58.250

DATE: 8/ 3/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 334 ENGINE TYPE AND MODEL: SPEY 511-14 SERIAL NUMBER: 7072

RATED THRUST: 11400.

ENGINE TOTAL TIME: 7500. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7500. HRS  
N2 COMPRESSOR OVERHAUL: 7500. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 7500. HRS  
N2 TURBINE OVERHAUL: 7500. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 73.00 FINISH 73.00

ATMOSPHERIC PRESSURE: START 29.06 FINISH 29.06

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 71.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 139.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TFMP AVERAGED  
PROBE CONFIG. AND LOCATION SAME AS USED FOR SPEY ON 08-02-71

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1000.00    | 2/ 0      | 11000.00           | 96                       | 5420.00          | 12360.00                 | 7280.00                 | -0.00    | -0.000000                           | -0.00                     | 2.50                         |
| 1005.00    | 3/ 2      | 10500.00           | 92                       | 8260.00          | 12210.00                 | 6860.00                 | -0.00    | -0.000000                           | -0.00                     | 2.44                         |
| 1010.00    | 4/ 3      | 9980.00            | 87                       | 8110.00          | 12070.00                 | 6480.00                 | -0.00    | -0.000000                           | -0.00                     | 2.34                         |
| 1015.00    | 5/ 4      | 7300.00            | 81                       | 7940.00          | 11900.00                 | 6030.00                 | -0.00    | -0.000000                           | -0.00                     | 2.24                         |
| 1015.00    | 6/ 5      | 7480.00            | 65                       | 7390.00          | 11630.00                 | 4710.00                 | -0.00    | -0.000000                           | -0.00                     | 1.98                         |
| 1025.00    | 1/ 6      | 610.00             | 5                        | 2670.00          | 7512.00                  | 900.00                  | -0.00    | -0.000000                           | -0.00                     | 1.05                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TFMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 96                       | 1160.00                    | 35.40                     | 30.70         | 2.94                 | 4.00           | 154.70        | 18.00           | 172.70          | 0.54      | -0.00 | -0.00        |
| 92                       | 117.50                     | 34.41                     | 30.70         | 2.90                 | 3.40           | 141.20        | 14.00           | 155.20          | 0.50      | -0.00 | -0.00        |
| 87                       | 1100.00                    | 33.18                     | 36.20         | 2.69                 | 3.10           | 124.70        | 28.00           | 152.70          | 0.53      | -0.00 | -0.00        |
| 81                       | 1065.00                    | 31.86                     | 37.70         | 2.53                 | 3.10           | 118.60        | 26.00           | 144.60          | 0.48      | -0.00 | -0.00        |
| 65                       | 975.00                     | 28.10                     | 45.00         | 2.19                 | 3.40           | 72.00         | 55.00           | 127.00          | 0.48      | -0.00 | -0.00        |
| 5                        | 830.00                     | 15.10                     | 630.00        | 2.14                 | 951.00         | 0.40          | 6.00            | 6.40            | 36.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS FMI CO LB/1K LB FUEL | MASS FMI HC LB/1K LB FUEL | MASS FMI NO2 LB/1K LB FUEL | MASS FMI CO2 LB/1K LB FUEL | MASS FMI NO LB/1K LB FUEL | MASS FMI NOX LB/1K LB FUEL | MASS FMI CO LB/HR | MASS FMI HC LB/HR | MASS FMI NO2 LB/HR | MASS FMI CO2 LB/HR | MASS FMI NO LB/HR | MASS FMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 96                       | 2.09                      | 0.16                      | 2.02                       | 3152.17                    | 17.34                     | 19.36                      | 15.25             | 1.14              | 14.69              | 22947.79           | 126.23            | 140.92             |
| 92                       | 2.20                      | 0.14                      | 1.65                       | 3152.05                    | 16.62                     | 18.26                      | 15.09             | 0.96              | 11.30              | 21623.05           | 113.99            | 125.29             |
| 87                       | 2.70                      | 0.13                      | 3.43                       | 3151.28                    | 15.27                     | 18.70                      | 17.49             | 0.86              | 22.22              | 20420.32           | 98.96             | 121.18             |
| 81                       | 2.99                      | 0.14                      | 3.38                       | 3150.81                    | 15.44                     | 18.83                      | 18.02             | 0.85              | 20.41              | 18999.37           | 93.11             | 113.52             |
| 65                       | 4.12                      | 0.18                      | 4.27                       | 3148.93                    | 10.82                     | 19.09                      | 19.40             | 0.84              | 38.94              | 14831.45           | 50.97             | 89.91              |
| 5                        | 55.30                     | 42.78                     | 0.87                       | 2951.62                    | 0.06                      | 0.92                       | 49.77             | 38.51             | 0.78               | 2656.46            | 0.05              | 0.81               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 96                       | 1.386          | 2086.162         | 0.103           | 11.476         | 1.335            | 12.811           |
| 92                       | 1.437          | 2059.339         | 0.091           | 10.856         | 1.076            | 11.933           |
| 87                       | 1.752          | 2046.125         | 0.086           | 9.916          | 2.226            | 12.142           |
| 81                       | 1.937          | 2042.943         | 0.091           | 10.012         | 2.195            | 12.206           |
| 65                       | 2.593          | 1982.815         | 0.112           | 6.815          | 5.206            | 12.021           |
| 5                        | 81.595         | 4354.848         | 63.124          | 0.085          | 1.276            | 1.362            |

CAL ID NUMBER: 334 ENGINE TYPE AND MODEL: SPEY 511-14  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 7072

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 36.765                    | 599.451               | 1.000              | 19.00                   | 11.642             | 189.83               | 61.331                | 144.40            | 0.08062            |
| TAKEOFF                            | 1.000               | 11400.0       | 13.374                    | 7753.320              | 1.000              | 0.70                    | 0.156              | 90.46                | 1.725                 | 133.00            | 0.00117            |
| CLIMBOUT                           | 0.850               | 9690.0        | 16.024                    | 6348.352              | 1.000              | 2.20                    | 0.588              | 232.77               | 2.524                 | 355.30            | 0.00165            |
| APPROACH                           | 0.400               | 4560.0        | 29.600                    | 3167.199              | 1.000              | 4.00                    | 1.973              | 211.15               | 9.346                 | 304.00            | 0.00649            |
| TAXI-IDLE                          | 0.040               | 456.0         | 36.765                    | 599.451               | 1.000              | 7.00                    | 4.289              | 69.94                | 61.331                | 53.20             | 0.08062            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 18.648             | 794.14               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 23.483             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 18.839             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.369              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 79.847                    | 599.451               | 1.000              | 19.00                   | 25.285             | 189.83               | 133.201               | 144.40            | 0.17510            |
| TAKEOFF                            | 1.000               | 11400.0       | 0.0                       | 7753.320              | 1.000              | 0.70                    | 0.0                | 90.46                | 0.0                   | 133.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 9690.0        | 0.190                     | 6348.352              | 1.000              | 2.20                    | 0.007              | 232.77               | 0.030                 | 355.30            | 0.00002            |
| APPROACH                           | 0.400               | 4560.0        | 0.950                     | 3167.199              | 1.000              | 4.00                    | 0.063              | 211.15               | 0.300                 | 304.00            | 0.00021            |
| TAXI-IDLE                          | 0.040               | 456.0         | 79.847                    | 599.451               | 1.000              | 7.00                    | 9.316              | 69.94                | 133.201               | 53.20             | 0.17510            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 34.671             | 794.14               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 43.658             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 35.025             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 0.639                     | 599.451               | 1.000              | 19.00                   | 0.202               | 189.83               | 1.067                 | 144.40            | 0.00140            |
| TAKEOFF                            | 1.000               | 11400.0       | 157.299                   | 7753.320              | 1.000              | 0.70                    | 1.835               | 90.46                | 20.288                | 133.00            | 0.01380            |
| CLIMBOUT                           | 0.850               | 9690.0        | 121.888                   | 6348.352              | 1.000              | 2.20                    | 4.469               | 232.77               | 19.200                | 355.30            | 0.01258            |
| APPROACH                           | 0.400               | 4560.0        | 36.918                    | 3167.199              | 1.000              | 4.00                    | 2.461               | 211.15               | 11.656                | 304.00            | 0.00810            |
| TAXI-IDLE                          | 0.040               | 456.0         | 0.639                     | 599.451               | 1.000              | 7.00                    | 0.075               | 69.94                | 1.067                 | 53.20             | 0.00140            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 9.043               | 794.14               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 11.387              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 9.135               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 160.979             |                      |                       |                   |                    |

DATE: 8/ 3/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 335 ENGINE TYPE AND MODEL: SPEY 511-14 SERIAL NUMBER: 7065

RATED THRUST: 11400.

ENGINE TOTAL TIME: 7861. HRS

TIME SINCE HOT SECTION OVERHAUL: 652. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7861. HRS  
N2 COMPRESSOR OVERHAUL: 7861. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 652. HRS  
N1 TURBINE OVERHAUL: 7861. HRS  
N2 TURBINE OVERHAUL: 7861. HRS

FUEL: JET - A FUEL W/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.08 FINISH 29.08

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 139.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 6

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
PROBE CONFIG. AND LOCATION SAME AS ON OR-02-71

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 155.00     | 2/ 0      | 11090.00           | 97                       | 8500.00 12400.00       | 7370.00                  | -0.00                   | -0.000000 | -0.00                               | 2.51                      | -0.00                        |
| 200.00     | 3/ 2      | 10800.00           | 94                       | 8390.00 12360.00       | 7140.00                  | -0.00                   | -0.000000 | -0.00                               | 2.47                      | -0.00                        |
| 210.00     | 4/ 3      | 10120.00           | 88                       | 8200.00 12200.00       | 6570.00                  | -0.00                   | -0.000000 | -0.00                               | 2.36                      | -0.00                        |
| 215.00     | 5/ 4      | 9510.00            | 83                       | 8030.00 12040.00       | 6120.00                  | -0.00                   | -0.000000 | -0.00                               | 2.28                      | -0.00                        |
| 220.00     | 6/ 5      | 7500.00            | 65                       | 7420.00 11630.00       | 4720.00                  | -0.00                   | -0.000000 | -0.00                               | 1.99                      | -0.00                        |
| 225.00     | 1/ 6      | 630.00             | 5                        | 2700.00 7540.00        | 930.00                   | -0.00                   | -0.000000 | -0.00                               | 1.59                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 97                       | 1165.00                    | 35.58                     | 34.20         | 2.93                 | 2.50           | 154.30        | 8.50            | 162.80          | 0.62      | -0.00 | -0.00        |
| 94                       | 1140.00                    | 34.98                     | 33.20         | 3.02                 | 1.30           | 143.90        | 11.50           | 155.40          | 0.37      | -0.00 | -0.00        |
| 88                       | 1100.00                    | 33.52                     | 34.20         | 2.67                 | 2.00           | 131.70        | 13.00           | 144.70          | 0.40      | -0.00 | -0.00        |
| 83                       | 1075.00                    | 32.33                     | 35.30         | 2.57                 | 2.00           | 122.00        | 18.50           | 140.50          | 0.29      | -0.00 | -0.00        |
| 65                       | 970.00                     | 28.13                     | 42.50         | 2.17                 | 2.00           | 88.50         | 16.50           | 105.00          | 0.34      | -0.00 | -0.00        |
| 5                        | 520.00                     | 22.72                     | 685.00        | 1.14                 | 850.00         | 6.70          | 3.00            | 9.70            | 38.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 97                       | 2.34                      | 0.10                      | 0.96                       | 3151.94                    | 17.35                     | 18.31                      | 17.26             | 0.72              | 7.04               | 23229.79           | 127.89            | 134.93             |
| 94                       | 2.21                      | 0.05                      | 1.25                       | 3152.29                    | 15.70                     | 16.96                      | 15.75             | 0.35              | 8.96               | 22507.33           | 112.11            | 121.07             |
| 88                       | 2.57                      | 0.09                      | 1.60                       | 3151.62                    | 16.25                     | 17.86                      | 16.88             | 0.57              | 10.54              | 20706.13           | 106.77            | 117.31             |
| 83                       | 2.75                      | 0.09                      | 2.37                       | 3151.32                    | 15.64                     | 18.01                      | 16.86             | 0.55              | 14.51              | 19286.05           | 95.71             | 110.22             |
| 65                       | 3.93                      | 0.11                      | 2.50                       | 3149.43                    | 13.43                     | 15.93                      | 18.53             | 0.50              | 11.82              | 14865.32           | 63.38             | 75.19              |
| 5                        | 106.37                    | 75.59                     | 0.77                       | 2781.38                    | 1.71                      | 2.47                       | 98.92             | 70.30             | 0.71               | 2586.68            | 1.59              | 2.30               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 97                       | 1.556          | 2094.661         | 0.065           | 11.532         | 0.635            | 12.167           |
| 94                       | 1.458          | 2084.012         | 0.073           | 10.381         | 0.810            | 11.211           |
| 88                       | 1.668          | 2046.060         | 0.056           | 10.551         | 1.041            | 11.592           |
| 83                       | 1.773          | 2027.976         | 0.058           | 10.064         | 1.526            | 11.590           |
| 65                       | 2.471          | 1982.042         | 0.067           | 8.450          | 1.576            | 10.026           |
| 5                        | 157.018        | 4105.848         | 111.590         | 2.523          | 1.130            | 3.652            |

CAL ID NUMBER: 335 ENGINE TYPE AND MODEL: SPEY 511-14  
TEST ORGANIZATION: U.S. BUREAU OF MINES

SERIAL NUMBER: 7065

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 75.001                    | 686.454               | 1.000              | 19.00                   | 23.750             | 217.38               | 109.259               | 144.40            | 0.16448            |
| TAKEOFF                            | 1.000               | 11400.0       | 11.450                    | 7669.500              | 1.000              | 0.70                    | 0.134              | 89.48                | 1.493                 | 133.00            | 0.00100            |
| CLIMBOUT                           | 0.850               | 9690.0        | 12.568                    | 6402.168              | 1.000              | 2.20                    | 0.461              | 234.75               | 1.963                 | 355.30            | 0.00130            |
| APPROACH                           | 0.400               | 4560.0        | 51.393                    | 3069.966              | 1.000              | 4.00                    | 3.426              | 204.66               | 16.741                | 304.00            | 0.01127            |
| TAXI-IDLE                          | 0.040               | 456.0         | 75.001                    | 686.454               | 1.000              | 7.00                    | 8.750              | 80.09                | 109.259               | 53.20             | 0.16448            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 36.521             | 826.35               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 44.196             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 36.894             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.172              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 52.981                    | 686.454               | 1.000              | 19.00                   | 16.777             | 217.38               | 77.180                | 144.40            | 0.11619            |
| TAKEOFF                            | 1.000               | 11400.0       | 0.0                       | 7669.500              | 1.000              | 0.70                    | 0.0                | 89.48                | 0.0                   | 133.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 9690.0        | 0.0                       | 6402.168              | 1.000              | 2.20                    | 0.0                | 234.75               | 0.0                   | 355.30            | 0.0                |
| APPROACH                           | 0.400               | 4560.0        | 10.579                    | 3069.966              | 1.000              | 4.00                    | 0.705              | 204.66               | 3.446                 | 304.00            | 0.00232            |
| TAXI-IDLE                          | 0.040               | 456.0         | 52.981                    | 686.454               | 1.000              | 7.00                    | 6.181              | 80.09                | 77.180                | 53.20             | 0.11619            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 23.664             | 826.35               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 28.636             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 23.905             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 1.386                     | 686.454               | 1.000              | 19.00                   | 0.439               | 217.38               | 2.019                 | 144.40            | 0.00304            |
| TAKEOFF                            | 1.000               | 11400.0       | 153.961                   | 7669.500              | 1.000              | 0.70                    | 1.796               | 89.48                | 20.074                | 133.00            | 0.01351            |
| CLIMBOUT                           | 0.850               | 9690.0        | 110.304                   | 6402.168              | 1.000              | 2.20                    | 4.044               | 234.75               | 17.229                | 355.30            | 0.01138            |
| APPROACH                           | 0.400               | 4560.0        | 30.075                    | 3069.966              | 1.000              | 4.00                    | 2.005               | 204.66               | 9.797                 | 304.00            | 0.00660            |
| TAXI-IDLE                          | 0.040               | 456.0         | 1.386                     | 686.454               | 1.000              | 7.00                    | 0.162               | 80.09                | 2.019                 | 53.20             | 0.00304            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.446               | 826.35               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 10.221              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.532               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 157.562             |                      |                       |                   |                    |

DATE: 8/ 2/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 336 ENGINE TYPE AND MODEL: SPEY 511-14

SERIAL NUMBER: 8091

RATED THRUST: 11400.

ENGINE TOTAL TIME: 2635. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 2130. HRS  
 N2 COMPRESSOR OVERHAUL: 2130. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDF VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A

FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.08 FINISH 29.08

INLET AIR HUMIDITY, LBS H2O/LA AIR: 0.0110

RELATIVE HUMIDITY: 53.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 141.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 8

COMMENTS:

H/C CAL ESTIMATED  
 SAMPLE LINE TEMP. AVERAGED  
 NEW PROBE CONFIGURATION

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 230.00     | 1/ 0      | 610.00                   | 5                  | 2700.00          | 7460.00                  | 890.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 235.00     | 2/ 1      | 10920.00                 | 95                 | 8480.00          | 12400.00                 | 7070.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 2/ 2      | 11000.00                 | 96                 | 8500.00          | 12460.00                 | 7100.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 245.00     | 3/ 2      | 10500.00                 | 92                 | 8330.00          | 12790.00                 | 6700.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 250.00     | 4/ 3      | 9950.00                  | 87                 | 8170.00          | 12150.00                 | 6200.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 255.00     | 5/ 4      | 9430.00                  | 82                 | 8010.00          | 12010.00                 | 5860.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 300.00     | 6/ 5      | 7470.00                  | 65                 | 7400.00          | 11660.00                 | 4510.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 305.00     | 1/ 6      | 630.00                   | 5                  | 2720.00          | 7710.00                  | 890.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 820.00                     | 15.26                     | 645.00        | 1.35                 | 1037.00        | 1.10          | 7.00            | 8.10            | -0.00     | -0.00 | -0.00        |
| 95                       | 1140.00                    | 35.28                     | 30.70         | 3.25                 | 4.50           | 172.10        | 29.07           | 201.00          | 0.83      | -0.00 | -0.00        |
| 96                       | 1135.00                    | 35.38                     | -0.00         | -0.00                | -0.00          | -0.00         | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 92                       | 1100.00                    | 34.38                     | 32.30         | 3.18                 | 3.50           | 158.20        | 40.00           | 198.20          | 0.70      | -0.00 | -0.00        |
| 87                       | 1075.00                    | 33.26                     | 33.30         | 2.98                 | 3.00           | 144.40        | 43.00           | 187.40          | 0.73      | -0.00 | -0.00        |
| 82                       | 1050.00                    | 32.03                     | 34.30         | 2.90                 | 2.80           | 130.70        | 41.00           | 171.70          | 0.68      | -0.00 | -0.00        |
| 65                       | 945                        | 27.38                     | 44.00         | 2.50                 | 2.60           | 81.90         | 36.00           | 127.90          | 0.53      | -0.00 | -0.00        |
| 5                        | 800.00                     | 15.26                     | 645.00        | 1.35                 | 734.00         | 0.0           | 8.00            | 8.00            | 41.50     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 85.33                     | 78.57                     | 1.52                       | 2806.25                    | 0.24                      | 1.76                       | 75.95             | 69.91             | 1.35               | 2497.56            | 0.21              | 1.57               |
| 95                       | 1.90                      | 0.16                      | 2.94                       | 3152.47                    | 17.45                     | 20.38                      | 13.40             | 1.12              | 20.79              | 22288.00           | 123.38            | 144.10             |
| 96                       | 0.20                      | 0.12                      | 0.33                       | 3155.26                    | 0.33                      | 0.66                       | 1.43              | 0.82              | 2.34               | 22402.34           | 2.34              | 4.68               |
| 92                       | 2.04                      | 0.13                      | 4.15                       | 3152.34                    | 16.39                     | 20.54                      | 13.65             | 0.85              | 27.77              | 21120.68           | 109.84            | 137.62             |
| 87                       | 2.28                      | 0.12                      | 4.75                       | 3152.00                    | 15.97                     | 20.72                      | 14.11             | 0.72              | 29.48              | 19542.37           | 98.99             | 128.47             |
| 82                       | 2.37                      | 0.11                      | 4.66                       | 3151.86                    | 14.85                     | 19.51                      | 13.90             | 0.65              | 27.30              | 18469.88           | 87.02             | 114.32             |
| 65                       | 1.53                      | 0.12                      | 4.74                       | 3150.02                    | 10.79                     | 16.85                      | 15.91             | 0.54              | 21.39              | 14206.58           | 48.65             | 75.98              |
| 5                        | 87.07                     | 56.75                     | 1.77                       | 2863.40                    | 0.0                       | 1.77                       | 77.49             | 50.51             | 1.58               | 2548.43            | 0.0               | 1.58               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 124.502        | 4094.167         | 114.641         | 0.349          | 2.219            | 2.568            |
| 95                       | 1.227          | 2041.025         | 0.103           | 11.299         | 1.904            | 13.196           |
| 96                       | 0.130          | 2036.577         | 0.074           | 0.213          | 0.213            | 0.426            |
| 92                       | 1.300          | 2011.493         | 0.081           | 10.461         | 2.645            | 13.106           |
| 87                       | 1.418          | 1964.058         | 0.072           | 9.949          | 2.963            | 12.912           |
| 82                       | 1.474          | 1958.630         | 0.069           | 9.228          | 2.895            | 12.171           |
| 65                       | 2.130          | 1901.818         | 0.072           | 6.513          | 2.863            | 10.171           |
| 5                        | 123.004        | 4045.120         | 80.168          | 0.0            | 2.506            | 2.506            |

CAL ID NUMBER: 336 ENGINE TYPE AND MODEL: SPEY 511-14 SERIAL NUMBER: 8091  
 TEST ORGANIZATION: U.S. BUREAU OF MINES

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 51.274                    | 554.190               | 1.000              | 19.00                   | 16.237             | 175.49               | 92.520                | 144.40            | 0.11244            |
| TAKEOFF                            | 1.000               | 11400.0       | 18.380                    | 7408.145              | 1.000              | 0.70                    | 0.214              | 86.43                | 2.481                 | 133.00            | 0.00161            |
| CLIMBOUT                           | 0.850               | 9690.0        | 16.475                    | 6271.344              | 1.000              | 2.20                    | 0.604              | 229.95               | 2.627                 | 355.30            | 0.00170            |
| APPROACH                           | 0.400               | 4560.0        | 32.205                    | 3091.461              | 1.000              | 4.00                    | 2.147              | 206.10               | 10.418                | 304.00            | 0.00706            |
| TAXI-IDLE                          | 0.040               | 456.0         | 51.274                    | 554.190               | 1.000              | 7.00                    | 5.982              | 64.66                | 92.520                | 53.20             | 0.11244            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 25.184             | 762.62               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 33.023             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 25.441             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 1.881              |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 67.567                    | 554.190               | 1.000              | 19.00                   | 21.396             | 175.49               | 121.920               | 144.40            | 0.14817            |
| TAKEOFF                            | 1.000               | 11400.0       | 0.0                       | 7408.145              | 1.000              | 0.70                    | 0.0                | 86.43                | 0.0                   | 133.00            | 0.0                |
| CLIMBOUT                           | 0.850               | 9690.0        | 0.244                     | 6271.344              | 1.000              | 2.20                    | 0.009              | 229.95               | 0.039                 | 355.30            | 0.00003            |
| APPROACH                           | 0.400               | 4560.0        | 1.368                     | 3091.461              | 1.000              | 4.00                    | 0.091              | 206.10               | 0.442                 | 304.00            | 0.00030            |
| TAXI-IDLE                          | 0.040               | 456.0         | 67.567                    | 554.190               | 1.000              | 7.00                    | 7.883              | 64.66                | 121.920               | 53.20             | 0.14817            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 29.379             | 762.62               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 38.524             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 29.679             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 0.0                |                      |                       |                   |                    |

| MODE                               | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|------------------------------------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                          | 0.040               | 456.0         | 0.526                     | 554.190               | 1.000              | 19.00                   | 0.167               | 175.49               | 0.950                 | 144.40            | 0.00115            |
| TAKEOFF                            | 1.000               | 11400.0       | 161.744                   | 7408.145              | 1.000              | 0.70                    | 1.887               | 86.43                | 21.833                | 133.00            | 0.01419            |
| CLIMBOUT                           | 0.850               | 9690.0        | 129.085                   | 6271.344              | 1.000              | 2.20                    | 4.733               | 229.95               | 20.583                | 355.30            | 0.01332            |
| APPROACH                           | 0.400               | 4560.0        | 30.586                    | 3091.461              | 1.000              | 4.00                    | 2.039               | 206.10               | 9.894                 | 304.00            | 0.00671            |
| TAXI-IDLE                          | 0.040               | 456.0         | 0.526                     | 554.190               | 1.000              | 7.00                    | 0.061               | 64.66                | 0.950                 | 53.20             | 0.00115            |
| TOTAL FOR CYCLE:                   |                     |               |                           |                       |                    |                         | 8.887               | 762.62               |                       | 989.90            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE:    |                     |               |                           |                       |                    |                         | 11.654              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE:   |                     |               |                           |                       |                    |                         | 8.978               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH AT T.O.: |                     |               |                           |                       |                    |                         | 165.528             |                      |                       |                   |                    |

DATE: 7/30/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 411 ENGINE TYPE AND MODEL: SPEY 511-14

SERIAL NUMBER: 7071

RATED THRUST: 11400.

ENGINE TOTAL TIME: 7237. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 1635. HRS  
 N2 COMPRESSOR OVERHAUL: 1635. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 1635. HRS  
 N2 TURBINE OVERHAUL: 1635. HRS

FUEL: JET - A

FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 14.45 FINISH 14.45

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0067

RELATIVE HUMIDITY: 54.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 137.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 10

COMMENTS:

SPEY PROBE 4.8" FROM TAILPIPE FOR FIRST THREE RUNS. PROBE FAILED AND A  
 JT3/A D PROBE USED FOR REMAINING RUNS BUT LOST ON RUN 5. SMALL SAMPLE FLOW  
 TAKEN THRU BROKEN SAMPLE LINE FOR REMAINDER OF RUNS.

| CLOCK TIME | TEST MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|--------------------------|-----------------------------------|------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 1130.00    | 1/ 0      | 430.00                   | 3                                 | 2500.00                      | 7375.00                           | 870.00                        | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 1135.00    | 1/ 1      | 550.00                   | 4                                 | 2590.00                      | 7480.00                           | 890.00                        | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 1140.00    | 2/ 1      | 11350.00                 | 99                                | 8440.00                      | 12280.00                          | -0.00                         | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 1255.00    | 1/ 2      | 580.00                   | 5                                 | 2680.00                      | 7630.00                           | 940.00                        | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 100.00     | 2/ 1      | 11360.00                 | 99                                | 8460.00                      | 12350.00                          | 7620.00                       | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 105.00     | 3/ 2      | 10820.00                 | 94                                | 8280.00                      | 12200.00                          | 7170.00                       | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 110.00     | 4/ 3      | 10350.00                 | 90                                | 8150.00                      | 12090.00                          | 6800.00                       | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 115.00     | 5/ 4      | 9830.00                  | 86                                | 8020.00                      | 11980.00                          | 6430.00                       | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 120.00     | 6/ 5      | 7500.00                  | 65                                | 7340.00                      | 11614.00                          | 4800.00                       | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |
| 125.00     | 1/ 6      | 600.00                   | 5                                 | 2710.00                      | 7730.00                           | 920.00                        | -0.00       | -0.000000                                    | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 3                                 | 820.00                              | 15.28                              | 860.00              | 1.45                          | 1361.00              | 0.0                 | 4.00                     | 4.00                     | -0.00     | -0.00 | -0.00        |
| 4                                 | 825.00                              | 15.28                              | 735.00              | 1.78                          | 950.00               | 0.0                 | 4.00                     | 4.00                     | -0.00     | -0.00 | -0.00        |
| 99                                | 1170.00                             | 36.25                              | 45.00               | 2.72                          | 19.70                | 141.50              | 9.00                     | 150.50                   | -0.00     | -0.00 | -0.00        |
| 5                                 | -0.00                               | -0.00                              | 710.00              | 1.43                          | 873.00               | 5.40                | 4.50                     | 9.90                     | -0.00     | -0.00 | -0.00        |
| 99                                | 1170.00                             | 36.45                              | 39.20               | 2.83                          | -0.00                | 141.30              | 9.00                     | 150.30                   | 1.22      | -0.00 | -0.00        |
| 94                                | 1135.00                             | 35.25                              | 38.20               | 2.67                          | -0.00                | 125.10              | 10.50                    | 135.60                   | 0.89      | -0.00 | -0.00        |
| 90                                | 1110.00                             | 34.30                              | 35.30               | 2.59                          | -0.00                | 119.20              | 11.00                    | 130.20                   | 0.75      | -0.00 | -0.00        |
| 86                                | 1090.00                             | 33.25                              | 35.10               | 2.49                          | -0.00                | 112.60              | 11.50                    | 124.10                   | 0.66      | -0.00 | -0.00        |
| 65                                | 975.00                              | 28.41                              | 36.30               | 2.41                          | -0.00                | 77.40               | 11.00                    | 88.40                    | 0.36      | -0.00 | -0.00        |
| 5                                 | 825.00                              | 15.43                              | 470.00              | 0.93                          | 659.00               | 0.0                 | 6.50                     | 6.50                     | 29.30     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 3                                 | 103.30                             | 93.63                              | 0.79                                | 2736.70                             | 0.0                                | 0.79                                | 89.38                   | 81.46                   | 0.69                     | 2380.93                  | 0.0                     | 0.69                     |
| 4                                 | 101.92                             | 75.45                              | 0.91                                | 2788.77                             | 0.0                                | 0.91                                | 90.71                   | 67.15                   | 0.81                     | 2482.01                  | 0.0                     | 0.81                     |
| 99                                | 3.32                               | 0.83                               | 1.09                                | 3148.40                             | 17.12                              | 18.21                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 5                                 | 89.79                              | 63.23                              | 0.93                                | 2841.36                             | 1.12                               | 2.06                                | 84.40                   | 59.43                   | 0.88                     | 2670.87                  | 1.05                    | 1.93                     |
| 99                                | 2.78                               | -0.00                              | 1.05                                | 3151.52                             | 16.45                              | 17.50                               | 21.17                   | -0.00                   | 7.98                     | 24014.61                 | 125.35                  | 133.33                   |
| 94                                | 2.87                               | -0.00                              | 1.30                                | 3151.38                             | 15.44                              | 16.73                               | 20.57                   | -0.00                   | 9.29                     | 22595.40                 | 110.67                  | 119.96                   |
| 90                                | 2.73                               | -0.00                              | 1.40                                | 3151.59                             | 15.16                              | 16.56                               | 18.59                   | -0.00                   | 9.52                     | 21430.83                 | 103.11                  | 112.62                   |
| 86                                | 2.84                               | -0.00                              | 1.52                                | 3151.42                             | 14.90                              | 16.42                               | 18.28                   | -0.00                   | 9.78                     | 20263.63                 | 95.79                   | 105.58                   |
| 65                                | 3.02                               | -0.00                              | 1.50                                | 3151.14                             | 10.58                              | 12.08                               | 14.50                   | -0.00                   | 7.22                     | 15125.48                 | 50.78                   | 58.00                    |
| 5                                 | 90.52                              | 72.69                              | 2.06                                | 2814.25                             | 0.0                                | 2.06                                | 83.28                   | 66.87                   | 1.89                     | 2589.11                  | 0.0                     | 1.89                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 3                                 | 209.012           | 5537.047               | 189.442            | 0.0               | 1.597                  | 1.597                  |
| 4                                 | 164.922           | 4512.742               | 122.085            | 0.0               | 1.474                  | 1.474                  |
| 99                                | -0.000            | -0.000                 | -0.000             | -0.000            | -0.000                 | -0.000                 |
| 5                                 | 145.516           | 4604.957               | 102.473            | 1.818             | 1.515                  | 3.133                  |
| 99                                | 1.864             | 2113.963               | -0.000             | 11.034            | 0.703                  | 11.737                 |
| 94                                | 1.902             | 2088.299               | -0.000             | 10.229            | 0.859                  | 11.087                 |
| 90                                | 1.796             | 2070.612               | -0.000             | 9.962             | 0.919                  | 10.882                 |
| 86                                | 1.860             | 2061.407               | -0.000             | 9.745             | 0.995                  | 10.740                 |
| 65                                | 1.933             | 2016.731               | -0.000             | 6.771             | 0.962                  | 7.733                  |
| 5                                 | 138.796           | 4315.180               | 111.457            | 0.0               | 3.153                  | 3.153                  |

CAL ID NUMBER: 411 ENGINE TYPE AND MODEL: SPEY 51L-14 SERIAL NUMBER: 7071  
 TEST ORGANIZATION: U.S. BUREAU OF MINES

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 456.0         | 77.652                    | 806.071               | 1.000              | 19.00                   | 24.590             | 255.26               | 96.334                | 144.40            | 0.17029            |
| TAKEOFF   | 1.000               | 11400.0       | 13.666                    | 7669.965              | 1.000              | 0.70                    | 0.159              | 89.48                | 1.782                 | 133.00            | 0.00120            |
| CLIMBOUT  | 0.850               | 9690.0        | 15.938                    | 6397.875              | 1.000              | 2.20                    | 0.584              | 234.59               | 2.491                 | 355.30            | 0.00164            |
| APPROACH  | 0.400               | 4560.0        | 43.075                    | 2878.047              | 1.000              | 4.00                    | 2.872              | 191.87               | 14.967                | 304.00            | 0.00945            |
| TAXI-IDLE | 0.040               | 456.0         | 77.652                    | 806.071               | 1.000              | 7.00                    | 9.059              | 94.04                | 96.334                | 53.20             | 0.17029            |

TOTAL FOR CYCLE: 37.265 865.24 989.90  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 43.069  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 37.645  
 LBS POLLUTANT/1000K LB TH AT T.O.: 1.399

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 456.0         | 63.808                    | 806.071               | 1.000              | 19.00                   | 20.206             | 255.26               | 79.159                | 144.40            | 0.13993            |
| TAKEOFF   | 1.000               | 11400.0       | 0.0                       | 7669.965              | 1.000              | 0.70                    | 0.0                | 89.48                | 0.0                   | 133.00            | 0.0                |
| CLIMBOUT  | 0.850               | 9690.0        | 0.535                     | 6397.875              | 1.000              | 2.20                    | 0.020              | 234.59               | 0.084                 | 355.30            | 0.00006            |
| APPROACH  | 0.400               | 4560.0        | 3.997                     | 2878.047              | 1.000              | 4.00                    | 0.266              | 191.87               | 1.389                 | 304.00            | 0.00088            |
| TAXI-IDLE | 0.040               | 456.0         | 63.808                    | 806.071               | 1.000              | 7.00                    | 7.444              | 94.04                | 79.159                | 53.20             | 0.13993            |

TOTAL FOR CYCLE: 27.936 865.24 989.90  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 32.287  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 28.221  
 LBS POLLUTANT/1000K LB TH AT T.O.: 0.0

| MODE      | FRACTIONAL<br>POWER | POWER<br># TH | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | USAGE<br>WT FACTOR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|-----------|---------------------|---------------|---------------------------|-----------------------|--------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE | 0.040               | 456.0         | 0.844                     | 806.071               | 1.000              | 19.00                   | 0.267               | 255.26               | 1.047                 | 144.40            | 0.00185            |
| TAKEOFF   | 1.000               | 11400.0       | 139.044                   | 7669.965              | 1.000              | 0.70                    | 1.622               | 89.48                | 18.128                | 133.00            | 0.01220            |
| CLIMBOUT  | 0.850               | 9690.0        | 97.758                    | 6397.875              | 1.000              | 2.20                    | 3.584               | 234.59               | 15.280                | 355.30            | 0.01009            |
| APPROACH  | 0.400               | 4560.0        | 24.203                    | 2878.047              | 1.000              | 4.00                    | 1.614               | 191.87               | 8.410                 | 304.00            | 0.00531            |
| TAXI-IDLE | 0.040               | 456.0         | 0.844                     | 806.071               | 1.000              | 7.00                    | 0.099               | 94.04                | 1.047                 | 53.20             | 0.00185            |

TOTAL FOR CYCLE: 7.186 865.24 989.90  
 LBS POLLUTANT/1K LB FUEL/CYCLE: 8.305  
 LBS POLLUTANT/1K LB TH-HR/CYCLE: 7.259  
 LBS POLLUTANT/1000K LB TH AT T.O.: 142.296

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 15.268                    | 548.004               | 19.00                   | 4.835              | 173.53               | 28.101                | 35.67           | 0.13553          |
|                                   | STD DEV | 3.519                     | 54.095                | 0.0                     | 1.115              | 17.13                | 6.597                 | 0.04            | 0.03124          |
| TAKEOFF                           | MEAN    | 2.150                     | 2079.317              | 0.50                    | 0.018              | 17.33                | 1.040                 | 31.29           | 0.00057          |
|                                   | STD DEV | 1.285                     | 77.480                | 0.0                     | 0.011              | 0.65                 | 0.627                 | 0.03            | 0.00034          |
| CLIMBOUT                          | MEAN    | 3.009                     | 1908.447              | 2.50                    | 0.125              | 79.52                | 1.579                 | 140.81          | 0.00089          |
|                                   | STD DEV | 0.791                     | 25.675                | 0.0                     | 0.033              | 1.08                 | 0.421                 | 0.18            | 0.00023          |
| APPROACH                          | MEAN    | 3.668                     | 1052.900              | 4.50                    | 0.275              | 78.97                | 3.482                 | 84.49           | 0.00326          |
|                                   | STD DEV | 0.841                     | 23.937                | 0.0                     | 0.063              | 1.79                 | 0.787                 | 0.14            | 0.00075          |
| TAXI-IDLE                         | MEAN    | 15.268                    | 548.004               | 7.00                    | 1.781              | 63.93                | 28.101                | 13.14           | 0.13553          |
|                                   | STD DEV | 3.519                     | 54.095                | 0.0                     | 0.411              | 6.31                 | 6.597                 | 0.01            | 0.03124          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 7.035              | 413.28               |                       | 305.41          |                  |
|                                   |         |                           |                       | STD DEV:                | 1.502              | 24.11                |                       | 0.0             |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 17.064             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 3.570              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 23.033             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 4.917              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.477              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.285              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 6.474                     | 548.004               | 19.00                   | 2.050              | 173.53               | 11.923                | 35.67           | 0.05747          |
|                                   | STD DEV | 1.612                     | 54.095                | 0.0                     | 0.511              | 17.13                | 3.054                 | 0.04            | 0.01431          |
| TAKEOFF                           | MEAN    | 0.430                     | 2079.317              | 0.50                    | 0.004              | 17.33                | 0.207                 | 31.29           | 0.00011          |
|                                   | STD DEV | 0.911                     | 77.480                | 0.0                     | 0.008              | 0.65                 | 0.438                 | 0.03            | 0.00024          |
| CLIMBOUT                          | MEAN    | 0.476                     | 1908.447              | 2.50                    | 0.020              | 79.52                | 0.250                 | 140.81          | 0.00014          |
|                                   | STD DEV | 0.976                     | 25.675                | 0.0                     | 0.041              | 1.08                 | 0.512                 | 0.18            | 0.00029          |
| APPROACH                          | MEAN    | 0.517                     | 1052.900              | 4.50                    | 0.039              | 78.97                | 0.491                 | 84.49           | 0.00046          |
|                                   | STD DEV | 1.004                     | 23.937                | 0.0                     | 0.075              | 1.79                 | 0.952                 | 0.14            | 0.00089          |
| TAXI-IDLE                         | MEAN    | 6.474                     | 548.004               | 7.00                    | 0.755              | 63.93                | 11.923                | 13.14           | 0.05747          |
|                                   | STD DEV | 1.612                     | 54.095                | 0.0                     | 0.188              | 6.31                 | 3.054                 | 0.01            | 0.01431          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 2.868              | 413.28               |                       | 305.41          |                  |
|                                   |         |                           |                       | STD DEV:                | 0.705              | 24.11                |                       | 0.0             |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 6.970              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 1.745              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 9.390              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 2.309              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.955              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 2.021              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE                         | MEAN    | 2.161                     | 548.004               | 19.00                   | 0.684               | 173.53               | 3.932                  | 35.67           | 0.01918           |
|                                   | STD DEV | 0.499                     | 54.095                | 0.0                     | 0.158               | 17.13                | 0.743                  | 0.04            | 0.00443           |
| TAKEOFF                           | MEAN    | 22.878                    | 2079.317              | 0.50                    | 0.191               | 17.33                | 10.984                 | 31.29           | 0.00609           |
|                                   | STD DEV | 3.566                     | 77.480                | 0.0                     | 0.030               | 0.65                 | 1.501                  | 0.03            | 0.00095           |
| CLIMBOUT                          | MEAN    | 21.212                    | 1908.447              | 2.50                    | 0.884               | 79.52                | 11.111                 | 140.81          | 0.00628           |
|                                   | STD DEV | 2.314                     | 25.675                | 0.0                     | 0.096               | 1.08                 | 1.154                  | 0.18            | 0.00068           |
| APPROACH                          | MEAN    | 7.776                     | 1052.900              | 4.50                    | 0.583               | 78.97                | 7.382                  | 84.49           | 0.00690           |
|                                   | STD DEV | 0.913                     | 23.937                | 0.0                     | 0.068               | 1.79                 | 0.812                  | 0.14            | 0.00081           |
| TAXI-IDLE                         | MEAN    | 2.161                     | 548.004               | 7.00                    | 0.252               | 63.93                | 3.932                  | 13.14           | 0.01918           |
|                                   | STD DEV | 0.499                     | 54.095                | 0.0                     | 0.058               | 6.31                 | 0.743                  | 0.01            | 0.00443           |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 2.594               | 413.28               |                        | 305.41          |                   |
|                                   |         |                           |                       | STD DEV:                | 0.378               | 24.11                |                        | 0.0             |                   |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 6.269               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 0.761               |                      |                        |                 |                   |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 8.494               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 1.237               |                      |                        |                 |                   |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 50.773              |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 7.914               |                      |                        |                 |                   |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 8.735                     | 493.001               | 19.00                   | 2.766              | 156.12               | 18.050                | 43.61           | 0.06342          |
|                                   | STD DEV | 7.491                     | 122.165               | 0.0                     | 2.372              | 38.68                | 13.473                | 0.09            | 0.05439          |
| TAKEOFF                           | MEAN    | 3.765                     | 2392.661              | 0.50                    | 0.031              | 19.94                | 1.565                 | 38.26           | 0.00082          |
|                                   | STD DEV | 1.293                     | 124.766               | 0.0                     | 0.011              | 1.04                 | 0.491                 | 0.05            | 0.00028          |
| CLIMBOUT                          | MEAN    | 3.404                     | 2188.467              | 2.50                    | 0.142              | 91.19                | 1.549                 | 172.16          | 0.00082          |
|                                   | STD DEV | 0.801                     | 95.255                | 0.0                     | 0.033              | 3.97                 | 0.317                 | 0.08            | 0.00019          |
| APPROACH                          | MEAN    | 3.489                     | 1145.895              | 4.50                    | 0.262              | 85.94                | 3.044                 | 103.30          | 0.00253          |
|                                   | STD DEV | 0.848                     | 19.792                | 0.0                     | 0.064              | 1.48                 | 0.731                 | 0.15            | 0.00062          |
| TAXI-IDLE                         | MEAN    | 8.735                     | 493.001               | 7.00                    | 1.019              | 57.52                | 18.050                | 16.07           | 0.06342          |
|                                   | STD DEV | 7.491                     | 122.165               | 0.0                     | 0.874              | 14.25                | 13.473                | 0.0             | 0.05439          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 4.220              | 410.70               |                       | 373.40          |                  |
|                                   |         |                           |                       | STD DEV:                | 3.248              | 54.63                |                       | 0.52            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 10.211             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 7.267              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 11.302             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 8.698              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.683              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.235              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 7.388                     | 493.001               | 19.00                   | 2.339              | 156.12               | 15.046                | 43.61           | 0.05364          |
|                                   | STD DEV | 5.338                     | 122.165               | 0.0                     | 1.690              | 38.68                | 9.232                 | 0.09            | 0.03876          |
| TAKEOFF                           | MEAN    | 0.440                     | 2392.661              | 0.50                    | 0.004              | 19.94                | 0.179                 | 38.26           | 0.00010          |
|                                   | STD DEV | 0.666                     | 124.766               | 0.0                     | 0.006              | 1.04                 | 0.272                 | 0.05            | 0.00015          |
| CLIMBOUT                          | MEAN    | 0.399                     | 2188.467              | 2.50                    | 0.017              | 91.19                | 0.179                 | 172.16          | 0.00010          |
|                                   | STD DEV | 0.590                     | 95.255                | 0.0                     | 0.025              | 3.97                 | 0.267                 | 0.08            | 0.00014          |
| APPROACH                          | MEAN    | 0.326                     | 1145.895              | 4.50                    | 0.024              | 85.94                | 0.286                 | 103.30          | 0.00024          |
|                                   | STD DEV | 0.321                     | 19.792                | 0.0                     | 0.024              | 1.48                 | 0.281                 | 0.15            | 0.00023          |
| TAXI-IDLE                         | MEAN    | 7.388                     | 493.001               | 7.00                    | 0.862              | 57.52                | 15.046                | 16.07           | 0.05364          |
|                                   | STD DEV | 5.338                     | 122.165               | 0.0                     | 0.623              | 14.25                | 9.232                 | 0.0             | 0.03876          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 3.246              | 410.70               |                       | 373.40          |                  |
|                                   |         |                           |                       | STD DEV:                | 2.305              | 54.63                |                       | 0.52            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 7.798              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 5.097              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 8.693              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 6.174              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.798              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 1.210              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE                         | MEAN    | 1.233                     | 493.001               | 19.00                   | 0.390               | 156.12               | 2.446                  | 43.61           | 0.00895           |
|                                   | STD DEV | 0.697                     | 122.165               | 0.0                     | 0.221               | 38.68                | 1.181                  | 0.09            | 0.00506           |
| TAKEOFF                           | MEAN    | 27.898                    | 2392.661              | 0.50                    | 0.232               | 19.94                | 11.655                 | 38.26           | 0.00608           |
|                                   | STD DEV | 11.532                    | 124.766               | 0.0                     | 0.096               | 1.04                 | 4.769                  | 0.05            | 0.00251           |
| CLIMBOUT                          | MEAN    | 22.201                    | 2188.467              | 2.50                    | 0.925               | 91.19                | 10.141                 | 172.16          | 0.00537           |
|                                   | STD DEV | 3.532                     | 95.255                | 0.0                     | 0.147               | 3.97                 | 1.550                  | 0.08            | 0.00085           |
| APPROACH                          | MEAN    | 7.323                     | 1145.895              | 4.50                    | 0.549               | 85.94                | 6.384                  | 103.30          | 0.00532           |
|                                   | STD DEV | 1.570                     | 19.792                | 0.0                     | 0.118               | 1.48                 | 1.324                  | 0.15            | 0.00114           |
| TAXI-IDLE                         | MEAN    | 1.233                     | 493.001               | 7.00                    | 0.144               | 57.52                | 2.446                  | 16.07           | 0.00895           |
|                                   | STD DEV | 0.697                     | 122.165               | 0.0                     | 0.081               | 14.25                | 1.181                  | 0.0             | 0.00506           |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 2.241               | 410.70               |                        | 373.40          |                   |
|                                   |         |                           |                       | STD DEV:                | 0.546               | 54.63                |                        | 0.52            |                   |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 5.431               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 0.998               |                      |                        |                 |                   |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.002               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 1.461               |                      |                        |                 |                   |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 50.639              |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 20.932              |                      |                        |                 |                   |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 3.533                     | 145.910               | 19.00                   | 1.119              | 46.20                | 24.351                | 11.11           | 0.10086          |
|                                   | STD DEV | 0.640                     | 16.530                | 0.0                     | 0.203              | 5.23                 | 4.413                 | 0.16            | 0.01989          |
| TAKEOFF                           | MEAN    | 0.393                     | 365.419               | 0.50                    | 0.003              | 3.05                 | 1.082                 | 4.87            | 0.00067          |
|                                   | STD DEV | 0.309                     | 9.366                 | 0.0                     | 0.003              | 0.08                 | 0.848                 | 0.07            | 0.00052          |
| CLIMBOUT                          | MEAN    | 0.568                     | 339.093               | 2.50                    | 0.024              | 14.13                | 1.684                 | 21.94           | 0.00107          |
|                                   | STD DEV | 0.313                     | 10.361                | 0.0                     | 0.013              | 0.43                 | 0.936                 | 0.32            | 0.00058          |
| APPROACH                          | MEAN    | 2.582                     | 206.096               | 4.50                    | 0.194              | 15.46                | 12.537                | 13.16           | 0.01469          |
|                                   | STD DEV | 0.443                     | 7.348                 | 0.0                     | 0.033              | 0.55                 | 2.145                 | 0.19            | 0.00235          |
| TAXI-IDLE                         | MEAN    | 3.533                     | 145.910               | 7.00                    | 0.412              | 17.02                | 24.351                | 4.09            | 0.10086          |
|                                   | STD DEV | 0.640                     | 16.530                | 0.0                     | 0.075              | 1.93                 | 4.413                 | 0.06            | 0.01989          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 1.752              | 95.86                |                       | 55.18           |                  |
|                                   |         |                           |                       | STD DEV:                | 0.235              | 8.08                 |                       | 0.82            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 18.310             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 2.290              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 31.788             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 4.764              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.556              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.435              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 0.879                     | 145.910               | 19.00                   | 0.278              | 46.20                | 6.091                 | 11.11           | 0.02520          |
|                                   | STD DEV | 0.579                     | 16.530                | 0.0                     | 0.183              | 5.23                 | 3.835                 | 0.16            | 0.01695          |
| TAKEOFF                           | MEAN    | 0.055                     | 365.419               | 0.50                    | 0.000              | 3.05                 | 0.153                 | 4.87            | 0.00009          |
|                                   | STD DEV | 0.062                     | 9.366                 | 0.0                     | 0.001              | 0.08                 | 0.175                 | 0.07            | 0.00011          |
| CLIMBOUT                          | MEAN    | 0.053                     | 339.093               | 2.50                    | 0.002              | 14.13                | 0.158                 | 21.94           | 0.00010          |
|                                   | STD DEV | 0.060                     | 10.361                | 0.0                     | 0.003              | 0.43                 | 0.184                 | 0.32            | 0.00011          |
| APPROACH                          | MEAN    | 0.240                     | 206.096               | 4.50                    | 0.018              | 15.46                | 1.177                 | 13.16           | 0.00136          |
|                                   | STD DEV | 0.125                     | 7.348                 | 0.0                     | 0.009              | 0.55                 | 0.643                 | 0.19            | 0.00070          |
| TAXI-IDLE                         | MEAN    | 0.879                     | 145.910               | 7.00                    | 0.103              | 17.02                | 6.091                 | 4.09            | 0.02520          |
|                                   | STD DEV | 0.579                     | 16.530                | 0.0                     | 0.067              | 1.93                 | 3.835                 | 0.06            | 0.01695          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.402              | 95.86                |                       | 55.18           |                  |
|                                   |         |                           |                       | STD DEV:                | 0.244              | 8.08                 |                       | 0.82            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 4.215              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 2.474              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 7.319              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 4.557              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.783              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.877              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE                         | MEAN    | 0.955                     | 145.910               | 19.00                   | 0.302               | 46.20                | 6.417                  | 11.11           | 0.02719           |
|                                   | STD DEV | 0.360                     | 16.530                | 0.0                     | 0.114               | 5.23                 | 1.795                  | 0.16            | 0.01016           |
| TAKEOFF                           | MEAN    | 3.639                     | 365.419               | 0.50                    | 0.030               | 3.05                 | 9.902                  | 4.87            | 0.00624           |
|                                   | STD DEV | 1.276                     | 9.366                 | 0.0                     | 0.011               | 0.08                 | 3.263                  | 0.07            | 0.00226           |
| CLIMBOUT                          | MEAN    | 3.313                     | 339.093               | 2.50                    | 0.138               | 14.13                | 9.706                  | 21.94           | 0.00631           |
|                                   | STD DEV | 1.191                     | 10.361                | 0.0                     | 0.050               | 0.43                 | 3.245                  | 0.32            | 0.00234           |
| APPROACH                          | MEAN    | 1.685                     | 206.096               | 4.50                    | 0.126               | 15.46                | 8.113                  | 13.16           | 0.00962           |
|                                   | STD DEV | 0.593                     | 7.348                 | 0.0                     | 0.044               | 0.55                 | 2.641                  | 0.19            | 0.00347           |
| TAXI-IDLE                         | MEAN    | 0.955                     | 145.910               | 7.00                    | 0.111               | 17.02                | 6.417                  | 4.09            | 0.02719           |
|                                   | STD DEV | 0.360                     | 16.530                | 0.0                     | 0.042               | 1.93                 | 1.795                  | 0.06            | 0.01016           |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.708               | 95.86                |                        | 55.18           |                   |
|                                   |         |                           |                       | STD DEV:                | 0.239               | 8.08                 |                        | 0.82            |                   |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 7.280               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 1.956               |                      |                        |                 |                   |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 12.850              |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 4.358               |                      |                        |                 |                   |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 51.975              |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 18.794              |                      |                        |                 |                   |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 63.767                    | 1000.692              | 19.00                   | 20.193             | 316.89               | 63.286                | 141.87            | 0.14234            |
|                                      | STD DEV | 13.744                    | 128.982               | 0.0                     | 4.352              | 40.84                | 7.654                 | 0.19              | 0.03068            |
| TAKEOFF                              | MEAN    | 29.071                    | 9959.773              | 0.70                    | 0.339              | 116.20               | 2.921                 | 180.67            | 0.00260            |
|                                      | STD DEV | 4.213                     | 251.241               | 0.0                     | 0.049              | 2.93                 | 0.437                 | 0.13              | 0.00038            |
| CLIMBOUT                             | MEAN    | 28.876                    | 8290.375              | 2.20                    | 1.059              | 303.98               | 3.488                 | 349.07            | 0.00303            |
|                                      | STD DEV | 4.592                     | 181.826               | 0.0                     | 0.168              | 6.67                 | 0.584                 | 0.0               | 0.00048            |
| APPROACH                             | MEAN    | 42.825                    | 3776.597              | 4.00                    | 2.855              | 251.77               | 11.509                | 298.67            | 0.00956            |
|                                      | STD DEV | 14.524                    | 314.310               | 0.0                     | 0.968              | 20.95                | 4.613                 | 0.0               | 0.00324            |
| TAXI-IDLE                            | MEAN    | 63.767                    | 1000.692              | 7.00                    | 7.440              | 116.75               | 63.286                | 52.27             | 0.14234            |
|                                      | STD DEV | 13.744                    | 128.982               | 0.0                     | 1.603              | 15.05                | 7.654                 | 0.06              | 0.03068            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 31.885             | 1105.58              |                       | 972.53            |                    |
|                                      |         |                           |                       | STD DEV:                | 6.547              | 62.21                |                       | 1.20              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 28.662             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.585              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 32.786             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 6.732              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 3.028              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.439              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 27.309                    | 1000.692              | 19.00                   | 8.648              | 316.89               | 27.147                | 141.87            | 0.06096            |
|                                      | STD DEV | 7.638                     | 128.982               | 0.0                     | 2.419              | 40.84                | 5.843                 | 0.19              | 0.01705            |
| TAKEOFF                              | MEAN    | 0.556                     | 9959.773              | 0.70                    | 0.006              | 116.20               | 0.056                 | 130.67            | 0.00005            |
|                                      | STD DEV | 0.547                     | 251.241               | 0.0                     | 0.006              | 2.93                 | 0.054                 | 0.13              | 0.00005            |
| CLIMBOUT                             | MEAN    | 0.583                     | 8290.375              | 2.20                    | 0.021              | 303.98               | 0.070                 | 349.07            | 0.00006            |
|                                      | STD DEV | 0.442                     | 181.826               | 0.0                     | 0.016              | 6.67                 | 0.053                 | 0.0               | 0.00005            |
| APPROACH                             | MEAN    | 2.427                     | 3776.597              | 4.00                    | 0.162              | 251.77               | 0.645                 | 298.67            | 0.00054            |
|                                      | STD DEV | 1.882                     | 314.310               | 0.0                     | 0.125              | 20.95                | 0.493                 | 0.0               | 0.00042            |
| TAXI-IDLE                            | MEAN    | 27.309                    | 1000.692              | 7.00                    | 3.186              | 116.75               | 27.147                | 52.27             | 0.06096            |
|                                      | STD DEV | 7.638                     | 128.982               | 0.0                     | 0.891              | 15.05                | 5.843                 | 0.06              | 0.01705            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 12.024             | 1105.58              |                       | 972.53            |                    |
|                                      |         |                           |                       | STD DEV:                | 3.297              | 62.21                |                       | 1.20              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 10.849             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.798              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 12.363             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.390              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.579              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.570              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 1.566                     | 1000.692              | 19.00                   | 0.496               | 316.89               | 1.547                 | 141.87            | 0.00350            |
|                                      | STD DEV | 0.450                     | 128.982               | 0.0                     | 0.143               | 40.84                | 0.323                 | 0.19              | 0.00101            |
| TAKEOFF                              | MEAN    | 110.632                   | 9959.773              | 0.70                    | 1.291               | 116.20               | 11.086                | 130.67            | 0.00988            |
|                                      | STD DEV | 17.743                    | 251.241               | 0.0                     | 0.207               | 2.93                 | 1.565                 | 0.13              | 0.00158            |
| CLIMBOUT                             | MEAN    | 73.982                    | 8290.375              | 2.20                    | 2.713               | 303.98               | 8.917                 | 349.07            | 0.00777            |
|                                      | STD DEV | 6.116                     | 181.826               | 0.0                     | 0.224               | 6.67                 | 0.600                 | 0.0               | 0.00064            |
| APPROACH                             | MEAN    | 17.845                    | 3776.597              | 4.00                    | 1.190               | 251.77               | 4.739                 | 298.67            | 0.00398            |
|                                      | STD DEV | 1.362                     | 314.310               | 0.0                     | 0.091               | 20.95                | 0.336                 | 0.0               | 0.00030            |
| TAXI-IDLE                            | MEAN    | 1.566                     | 1000.692              | 7.00                    | 0.183               | 116.75               | 1.547                 | 52.27             | 0.00350            |
|                                      | STD DEV | 0.450                     | 128.982               | 0.0                     | 0.053               | 15.05                | 0.323                 | 0.06              | 0.00101            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 5.872               | 1105.58              |                       | 972.53            |                    |
|                                      |         |                           |                       | STD DEV:                | 0.466               | 62.21                |                       | 1.20              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.315               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.376               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.037               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.479               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 115.242             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 18.482              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 92.626                    | 1197.786              | 19.00                   | 29.332             | 379.30               | 77.296                | 187.74            | 0.15618            |
|                                      | STD DEV | 38.370                    | 89.053                | 0.0                     | 12.151             | 28.20                | 30.070                | 5.99              | 0.06362            |
| TAKEOFF                              | MEAN    | 9.036                     | 10183.211             | 0.70                    | 0.105              | 118.80               | 0.879                 | 138.33            | 0.00076            |
|                                      | STD DEV | 7.896                     | 413.273               | 0.0                     | 0.092              | 4.82                 | 0.756                 | 4.41              | 0.00066            |
| CLIMBOUT                             | MEAN    | 15.957                    | 8509.188              | 2.20                    | 0.585              | 312.00               | 1.873                 | 369.55            | 0.00158            |
|                                      | STD DEV | 8.429                     | 342.477               | 0.0                     | 0.309              | 12.56                | 0.972                 | 11.78             | 0.00082            |
| APPROACH                             | MEAN    | 49.015                    | 4115.418              | 4.00                    | 3.268              | 274.36               | 12.199                | 316.19            | 0.01030            |
|                                      | STD DEV | 23.793                    | 245.341               | 0.0                     | 1.586              | 16.36                | 6.355                 | 10.08             | 0.00489            |
| TAXI-IDLE                            | MEAN    | 92.626                    | 1197.786              | 7.00                    | 10.806             | 139.74               | 77.296                | 69.17             | 0.15618            |
|                                      | STD DEV | 38.370                    | 89.053                | 0.0                     | 4.477              | 10.39                | 30.070                | 2.21              | 0.06362            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 44.096             | 1224.21              |                       | 1080.97           |                    |
|                                      |         |                           |                       | STD DEV:                | 18.172             | 44.98                |                       | 34.50             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 36.092             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 14.530             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 40.766             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 16.495             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.882              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.764              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 92.190                    | 1197.786              | 19.00                   | 29.193             | 379.30               | 78.505                | 187.74            | 0.15729            |
|                                      | STD DEV | 54.930                    | 89.053                | 0.0                     | 17.394             | 28.20                | 47.516                | 5.99              | 0.09770            |
| TAKEOFF                              | MEAN    | 0.855                     | 10183.211             | 0.70                    | 0.010              | 118.80               | 0.086                 | 138.33            | 0.00007            |
|                                      | STD DEV | 1.346                     | 413.273               | 0.0                     | 0.016              | 4.82                 | 0.135                 | 4.41              | 0.00012            |
| CLIMBOUT                             | MEAN    | 0.893                     | 8509.188              | 2.20                    | 0.033              | 312.00               | 0.106                 | 369.55            | 0.00009            |
|                                      | STD DEV | 0.598                     | 342.477               | 0.0                     | 0.022              | 12.56                | 0.071                 | 11.78             | 0.00006            |
| APPROACH                             | MEAN    | 8.261                     | 4115.418              | 4.00                    | 0.551              | 274.36               | 2.018                 | 316.19            | 0.00173            |
|                                      | STD DEV | 6.687                     | 245.341               | 0.0                     | 0.446              | 16.36                | 1.626                 | 10.08             | 0.00139            |
| TAXI-IDLE                            | MEAN    | 92.190                    | 1197.786              | 7.00                    | 10.755             | 139.74               | 78.505                | 69.17             | 0.15729            |
|                                      | STD DEV | 54.930                    | 89.053                | 0.0                     | 6.408              | 10.39                | 47.516                | 2.21              | 0.09770            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 40.542             | 1224.21              |                       | 1080.97           |                    |
|                                      |         |                           |                       | STD DEV:                | 23.891             | 44.98                |                       | 34.50             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 33.500             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 20.138             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 37.926             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 23.285             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.864              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.362              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENFRGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 2.489                     | 1197.786              | 19.00                   | 0.788               | 379.30               | 2.065                 | 187.74            | 0.00419            |
|                                      | STD DEV | 0.787                     | 89.053                | 0.0                     | 0.249               | 28.20                | 0.578                 | 5.99              | 0.00127            |
| TAKEOFF                              | MEAN    | 119.008                   | 10183.211             | 0.70                    | 1.388               | 118.80               | 11.637                | 138.33            | 0.01000            |
|                                      | STD DEV | 25.788                    | 413.273               | 0.0                     | 0.301               | 4.82                 | 2.240                 | 4.41              | 0.00201            |
| CLIMBOUT                             | MEAN    | 84.675                    | 8509.188              | 2.20                    | 3.105               | 312.00               | 9.929                 | 369.55            | 0.00839            |
|                                      | STD DEV | 13.642                    | 342.477               | 0.0                     | 0.500               | 12.56                | 1.398                 | 11.78             | 0.00122            |
| APPROACH                             | MEAN    | 23.212                    | 4115.418              | 4.00                    | 1.547               | 274.36               | 5.654                 | 316.19            | 0.00490            |
|                                      | STD DEV | 2.698                     | 245.341               | 0.0                     | 0.180               | 16.36                | 0.734                 | 10.08             | 0.00061            |
| TAXI-IDLE                            | MEAN    | 2.489                     | 1197.786              | 7.00                    | 0.290               | 139.74               | 2.065                 | 69.17             | 0.00419            |
|                                      | STD DEV | 0.787                     | 89.053                | 0.0                     | 0.092               | 10.39                | 0.578                 | 2.21              | 0.00127            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 7.119               | 1224.21              |                       | 1080.97           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.998               | 44.98                |                       | 34.50             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.820               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.837               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.576               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.816               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 116.722             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 23.396              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 109.109                   | 871.960               | 19.00                   | 34.551             | 276.12               | 124.010               | 292.91            | 0.11864            |
|                                      | STD DEV | 59.629                    | 196.805               | 0.0                     | 18.883             | 62.32                | 58.770                | 18.07             | 0.06647            |
| TAKEOFF                              | MEAN    | 12.269                    | 10835.289             | 0.70                    | 0.143              | 126.41               | 1.137                 | 215.83            | 0.00066            |
|                                      | STD DEV | 8.507                     | 821.060               | 0.0                     | 0.099              | 9.58                 | 0.781                 | 13.32             | 0.00045            |
| CLIMBOUT                             | MEAN    | 15.303                    | 8955.805              | 2.20                    | 0.561              | 328.38               | 1.735                 | 576.58            | 0.00098            |
|                                      | STD DEV | 7.927                     | 662.439               | 0.0                     | 0.291              | 24.29                | 0.940                 | 35.57             | 0.00052            |
| APPROACH                             | MEAN    | 39.678                    | 4137.551              | 4.00                    | 2.645              | 275.84               | 9.634                 | 493.33            | 0.00539            |
|                                      | STD DEV | 19.986                    | 350.089               | 0.0                     | 1.332              | 23.34                | 4.890                 | 30.43             | 0.00280            |
| TAXI-IDLE                            | MEAN    | 109.109                   | 871.960               | 7.00                    | 12.729             | 101.73               | 124.010               | 107.92            | 0.11864            |
|                                      | STD DEV | 59.629                    | 196.805               | 0.0                     | 6.957              | 22.96                | 58.770                | 6.65              | 0.06647            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 50.630             | 1108.48              |                       | 1686.58           |                    |
|                                      |         |                           |                       | STD DEV:                | 25.900             | 114.52               |                       | 103.94            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 45.194             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 22.182             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 30.191             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 15.854             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.768              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.522              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 98.643                    | 871.960               | 19.00                   | 31.237             | 276.12               | 115.413               | 292.91            | 0.10699            |
|                                      | STD DEV | 58.151                    | 196.805               | 0.0                     | 18.414             | 62.32                | 70.759                | 18.07             | 0.06461            |
| TAKEOFF                              | MEAN    | 4.654                     | 10835.289             | 0.70                    | 0.054              | 126.41               | 0.416                 | 215.83            | 0.00025            |
|                                      | STD DEV | 8.731                     | 821.060               | 0.0                     | 0.102              | 9.58                 | 0.783                 | 13.32             | 0.00048            |
| CLIMBOUT                             | MEAN    | 4.915                     | 8955.805              | 2.20                    | 0.180              | 328.38               | 0.536                 | 576.58            | 0.00031            |
|                                      | STD DEV | 8.419                     | 662.439               | 0.0                     | 0.309              | 24.29                | 0.912                 | 35.57             | 0.00055            |
| APPROACH                             | MEAN    | 7.842                     | 4137.551              | 4.00                    | 0.523              | 275.84               | 1.884                 | 493.33            | 0.00107            |
|                                      | STD DEV | 6.332                     | 350.089               | 0.0                     | 0.422              | 23.34                | 1.491                 | 30.43             | 0.00089            |
| TAXI-IDLE                            | MEAN    | 98.643                    | 871.960               | 7.00                    | 11.508             | 101.73               | 115.413               | 107.92            | 0.10699            |
|                                      | STD DEV | 58.151                    | 196.805               | 0.0                     | 6.784              | 22.96                | 70.759                | 6.65              | 0.06461            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 43.503             | 1108.48              |                       | 1686.58           |                    |
|                                      |         |                           |                       | STD DEV:                | 25.319             | 114.52               |                       | 103.94            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 39.030             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 23.114             |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 25.880             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 15.438             |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 2.933              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.627              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 1.433                     | 871.960               | 19.00                   | 0.454               | 276.12               | 1.664                 | 292.91            | 0.00155            |
|                                      | STD DEV | 0.532                     | 196.805               | 0.0                     | 0.168               | 62.32                | 0.478                 | 18.07             | 0.00055            |
| TAKEOFF                              | MEAN    | 148.125                   | 10835.289             | 0.70                    | 1.728               | 126.41               | 13.613                | 215.83            | 0.00798            |
|                                      | STD DEV | 25.842                    | 821.060               | 0.0                     | 0.301               | 9.58                 | 1.656                 | 13.32             | 0.00106            |
| CLIMBOUT                             | MEAN    | 96.218                    | 8955.805              | 2.20                    | 3.528               | 328.38               | 10.720                | 576.58            | 0.00610            |
|                                      | STD DEV | 14.259                    | 662.439               | 0.0                     | 0.523               | 24.29                | 1.097                 | 35.57             | 0.00066            |
| APPROACH                             | MEAN    | 21.784                    | 4137.551              | 4.00                    | 1.452               | 275.84               | 5.277                 | 493.33            | 0.00294            |
|                                      | STD DEV | 3.099                     | 350.089               | 0.0                     | 0.207               | 23.34                | 0.694                 | 30.43             | 0.00035            |
| TAXI-IDLE                            | MEAN    | 1.433                     | 871.960               | 7.00                    | 0.167               | 101.73               | 1.664                 | 107.92            | 0.00155            |
|                                      | STD DEV | 0.532                     | 196.805               | 0.0                     | 0.062               | 22.96                | 0.478                 | 6.65              | 0.00055            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 7.329               | 1108.48              |                       | 1686.58           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.090               | 114.52               |                       | 103.94            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 6.646               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.940               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.335               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.480               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 93.083              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 12.371              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 62.787                    | 1388.763              | 19.00                   | 19.882             | 439.78               | 45.231                | 277.08            | 0.07176            |
|                                      | STD DEV | 17.688                    | 103.796               | 0.0                     | 5.601              | 32.86                | 11.907                | 0.0               | 0.02021            |
| TAKEOFF                              | MEAN    | 18.823                    | 15511.203             | 0.70                    | 0.220              | 180.96               | 1.214                 | 204.17            | 0.00108            |
|                                      | STD DEV | 3.994                     | 427.062               | 0.0                     | 0.047              | 4.98                 | 0.258                 | 0.0               | 0.00023            |
| CLIMBOUT                             | MEAN    | 18.277                    | 13066.484             | 2.20                    | 0.670              | 479.10               | 1.399                 | 545.42            | 0.00123            |
|                                      | STD DEV | 3.129                     | 240.685               | 0.0                     | 0.115              | 8.78                 | 0.235                 | 0.0               | 0.00021            |
| APPROACH                             | MEAN    | 26.326                    | 5993.734              | 4.00                    | 1.755              | 399.58               | 4.412                 | 466.67            | 0.00376            |
|                                      | STD DEV | 9.529                     | 324.933               | 0.0                     | 0.635              | 21.66                | 1.671                 | 0.0               | 0.00136            |
| TAXI-IDLE                            | MEAN    | 62.787                    | 1388.763              | 7.00                    | 7.325              | 162.02               | 45.231                | 102.08            | 0.07176            |
|                                      | STD DEV | 17.688                    | 103.796               | 0.0                     | 2.064              | 12.11                | 11.907                | 0.16              | 0.02021            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 29.852             | 1661.45              |                       | 1595.41           |                    |
|                                      |         |                           |                       | STD DEV:                | 8.042              | 47.30                |                       | 1.51              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 17.971             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.802              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 18.711             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.041              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 1.255              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.266              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 64.828                    | 1388.763              | 19.00                   | 20.529             | 439.78               | 46.766                | 277.08            | 0.07409            |
|                                      | STD DEV | 12.819                    | 103.796               | 0.0                     | 4.059              | 32.86                | 8.940                 | 0.0               | 0.01465            |
| TAKEOFF                              | MEAN    | 0.674                     | 15511.203             | 0.70                    | 0.008              | 180.96               | 0.043                 | 204.17            | 0.00004            |
|                                      | STD DEV | 0.934                     | 427.062               | 0.0                     | 0.011              | 4.98                 | 0.060                 | 0.0               | 0.00005            |
| CLIMBOUT                             | MEAN    | 1.274                     | 13066.484             | 2.20                    | 0.047              | 479.10               | 0.096                 | 545.42            | 0.00009            |
|                                      | STD DEV | 2.120                     | 240.685               | 0.0                     | 0.078              | 8.78                 | 0.160                 | 0.0               | 0.00014            |
| APPROACH                             | MEAN    | 3.834                     | 5993.734              | 4.00                    | 0.256              | 399.58               | 0.646                 | 466.67            | 0.00055            |
|                                      | STD DEV | 2.383                     | 324.933               | 0.0                     | 0.159              | 21.66                | 0.413                 | 0.0               | 0.00034            |
| TAXI-IDLE                            | MEAN    | 64.828                    | 1388.763              | 7.00                    | 7.563              | 162.02               | 46.766                | 102.08            | 0.07409            |
|                                      | STD DEV | 12.819                    | 103.796               | 0.0                     | 1.496              | 12.11                | 8.940                 | 0.16              | 0.01465            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 28.402             | 1661.45              |                       | 1595.41           |                    |
|                                      |         |                           |                       | STD DEV:                | 5.487              | 47.30                |                       | 1.51              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 17.071             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.091              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 17.802             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.439              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.449              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.623              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 2.708                     | 1388.763              | 19.00                   | 0.857               | 439.78               | 1.941                  | 277.08            | 0.00309             |
|                                      | STD DEV | 0.629                     | 103.796               | 0.0                     | 0.199               | 32.86                | 0.374                  | 0.0               | 0.00072             |
| TAKEOFF                              | MEAN    | 236.335                   | 15511.203             | 0.70                    | 2.757               | 180.96               | 15.224                 | 204.17            | 0.01350             |
|                                      | STD DEV | 28.993                    | 427.062               | 0.0                     | 0.338               | 4.98                 | 1.714                  | 0.0               | 0.00166             |
| CLIMBOUT                             | MEAN    | 155.298                   | 13066.484             | 2.20                    | 5.694               | 479.10               | 11.881                 | 545.42            | 0.01044             |
|                                      | STD DEV | 9.813                     | 240.685               | 0.0                     | 0.360               | 8.78                 | 0.641                  | 0.0               | 0.00066             |
| APPROACH                             | MEAN    | 35.859                    | 5993.734              | 4.00                    | 2.391               | 399.58               | 5.976                  | 466.67            | 0.00512             |
|                                      | STD DEV | 4.203                     | 324.933               | 0.0                     | 0.280               | 21.66                | 0.526                  | 0.0               | 0.00060             |
| TAXI-IDLE                            | MEAN    | 2.708                     | 1388.763              | 7.00                    | 0.316               | 162.02               | 1.941                  | 102.08            | 0.00309             |
|                                      | STD DEV | 0.629                     | 103.796               | 0.0                     | 0.073               | 12.11                | 0.374                  | 0.16              | 0.00072             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 12.015              | 1661.45              |                        | 1595.41           |                     |
|                                      |         |                           |                       | STD DEV:                | 0.803               | 47.30                |                        | 1.51              |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 7.231               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.419               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 7.531               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.503               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 157.557             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 19.329              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 41.395                    | 823.275               | 19.00                   | 13.108             | 260.70               | 50.320                | 266.00            | 0.04928            |
|                                      | STD DEV | 11.148                    | 113.528               | 0.0                     | 3.530              | 35.95                | 13.014                | 0.0               | 0.01327            |
| TAKEOFF                              | MEAN    | 7.975                     | 8517.727              | 0.70                    | 0.093              | 99.37                | 0.934                 | 163.33            | 0.00057            |
|                                      | STD DEV | 3.354                     | 165.892               | 0.0                     | 0.039              | 1.94                 | 0.388                 | 0.0               | 0.00024            |
| CLIMBOUT                             | MEAN    | 10.621                    | 7116.582              | 2.20                    | 0.389              | 260.94               | 1.493                 | 436.33            | 0.00089            |
|                                      | STD DEV | 4.385                     | 95.555                | 0.0                     | 0.161              | 3.51                 | 0.617                 | 0.0               | 0.00037            |
| APPROACH                             | MEAN    | 17.920                    | 3445.414              | 4.00                    | 1.195              | 229.69               | 5.210                 | 373.33            | 0.00320            |
|                                      | STD DEV | 1.665                     | 180.022               | 0.0                     | 0.111              | 12.00                | 0.518                 | 0.0               | 0.00030            |
| TAXI-IDLE                            | MEAN    | 41.395                    | 823.275               | 7.00                    | 4.829              | 96.05                | 50.320                | 98.00             | 0.04928            |
|                                      | STD DEV | 11.148                    | 113.528               | 0.0                     | 1.301              | 13.24                | 13.014                | 0.14              | 0.01327            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 19.615             | 946.76               |                       | 1337.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 4.967              | 49.19                |                       | 2.08              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 20.657             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.947              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 14.671             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.715              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.665              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.279              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 8.322                     | 823.275               | 19.00                   | 2.635              | 260.70               | 10.102                | 266.00            | 0.00991            |
|                                      | STD DEV | 3.003                     | 113.528               | 0.0                     | 0.951              | 35.95                | 3.399                 | 0.0               | 0.00357            |
| TAKEOFF                              | MEAN    | 0.373                     | 8517.727              | 0.70                    | 0.004              | 99.37                | 0.043                 | 163.33            | 0.00003            |
|                                      | STD DEV | 0.563                     | 165.892               | 0.0                     | 0.007              | 1.94                 | 0.066                 | 0.0               | 0.00004            |
| CLIMBOUT                             | MEAN    | 0.313                     | 7116.582              | 2.20                    | 0.011              | 260.94               | 0.044                 | 436.33            | 0.00003            |
|                                      | STD DEV | 0.459                     | 95.555                | 0.0                     | 0.017              | 3.51                 | 0.065                 | 0.0               | 0.00004            |
| APPROACH                             | MEAN    | 1.179                     | 3445.414              | 4.00                    | 0.079              | 229.69               | 0.332                 | 373.33            | 0.00021            |
|                                      | STD DEV | 1.372                     | 180.022               | 0.0                     | 0.091              | 12.00                | 0.368                 | 0.0               | 0.00024            |
| TAXI-IDLE                            | MEAN    | 8.322                     | 823.275               | 7.00                    | 0.971              | 96.05                | 10.102                | 98.00             | 0.00991            |
|                                      | STD DEV | 3.003                     | 113.528               | 0.0                     | 0.350              | 13.24                | 3.399                 | 0.14              | 0.00357            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 3.701              | 946.76               |                       | 1337.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.276              | 49.19                |                       | 2.08              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 3.901              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.306              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 2.768              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.954              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.311              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.469              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 1.765                     | 823.275               | 19.00                   | 0.559               | 260.70               | 2.172                 | 266.00            | 0.00210            |
|                                      | STD DEV | 0.257                     | 113.528               | 0.0                     | 0.081               | 35.95                | 0.410                 | 0.0               | 0.00031            |
| TAKEOFF                              | MEAN    | 101.636                   | 8517.727              | 0.70                    | 1.186               | 99.37                | 11.930                | 163.33            | 0.00726            |
|                                      | STD DEV | 14.360                    | 165.892               | 0.0                     | 0.168               | 1.94                 | 1.644                 | 0.0               | 0.00103            |
| CLIMBOUT                             | MEAN    | 67.746                    | 7116.582              | 2.20                    | 2.484               | 260.94               | 9.517                 | 436.33            | 0.00569            |
|                                      | STD DEV | 11.251                    | 95.555                | 0.0                     | 0.413               | 3.51                 | 1.559                 | 0.0               | 0.00095            |
| APPROACH                             | MEAN    | 16.952                    | 3445.414              | 4.00                    | 1.130               | 229.69               | 4.959                 | 373.33            | 0.00303            |
|                                      | STD DEV | 2.870                     | 180.022               | 0.0                     | 0.191               | 12.00                | 1.097                 | 0.0               | 0.00051            |
| TAXI-IDLE                            | MEAN    | 1.765                     | 823.275               | 7.00                    | 0.206               | 96.05                | 2.172                 | 98.00             | 0.00210            |
|                                      | STD DEV | 0.257                     | 113.528               | 0.0                     | 0.030               | 13.24                | 0.410                 | 0.14              | 0.00031            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 5.565               | 946.76               |                       | 1337.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.582               | 49.19                |                       | 2.08              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.904               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.805               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.162               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.435               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 84.697              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 11.967              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 37.389                    | 857.216               | 19.00                   | 11.840             | 271.45               | 43.746                | 275.50            | 0.04298            |
|                                      | STD DEV | 11.750                    | 114.788               | 0.0                     | 3.721              | 36.35                | 13.411                | 0.54              | 0.01351            |
| TAKEOFF                              | MEAN    | 5.617                     | 8677.555              | 0.70                    | 0.066              | 101.24               | 0.648                 | 169.17            | 0.00039            |
|                                      | STD DEV | 1.997                     | 210.983               | 0.0                     | 0.023              | 2.45                 | 0.232                 | 0.11              | 0.00014            |
| CLIMBOUT                             | MEAN    | 6.204                     | 7171.270              | 2.20                    | 0.227              | 262.95               | 0.867                 | 451.92            | 0.00050            |
|                                      | STD DEV | 1.928                     | 160.470               | 0.0                     | 0.071              | 5.88                 | 0.274                 | 0.94              | 0.00016            |
| APPROACH                             | MEAN    | 11.960                    | 3572.512              | 4.00                    | 0.797              | 238.17               | 3.420                 | 386.67            | 0.00206            |
|                                      | STD DEV | 4.937                     | 452.440               | 0.0                     | 0.329              | 30.16                | 1.486                 | 0.59              | 0.00085            |
| TAXI-IDLE                            | MEAN    | 37.389                    | 857.216               | 7.00                    | 4.362              | 100.01               | 43.746                | 101.50            | 0.04298            |
|                                      | STD DEV | 11.750                    | 114.788               | 0.0                     | 1.371              | 13.39                | 13.411                | 0.06              | 0.01351            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 17.292             | 973.81               |                       | 1384.75           |                    |
|                                      |         |                           |                       | STD DEV:                | 5.133              | 67.79                |                       | 1.37              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 17.748             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.109              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 12.488             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.707              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.452              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.161              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 8.755                     | 857.216               | 19.00                   | 2.772              | 271.45               | 10.131                | 275.50            | 0.01006            |
|                                      | STD DEV | 5.754                     | 114.788               | 0.0                     | 1.822              | 36.35                | 5.784                 | 0.54              | 0.00661            |
| TAKEOFF                              | MEAN    | 0.381                     | 8677.555              | 0.70                    | 0.004              | 101.24               | 0.044                 | 169.17            | 0.00003            |
|                                      | STD DEV | 0.840                     | 210.983               | 0.0                     | 0.010              | 2.45                 | 0.097                 | 0.11              | 0.00006            |
| CLIMBOUT                             | MEAN    | 0.396                     | 7171.270              | 2.20                    | 0.015              | 262.95               | 0.055                 | 451.92            | 0.00003            |
|                                      | STD DEV | 0.736                     | 160.470               | 0.0                     | 0.027              | 5.88                 | 0.098                 | 0.94              | 0.00006            |
| APPROACH                             | MEAN    | 0.850                     | 3572.512              | 4.00                    | 0.057              | 238.17               | 0.224                 | 386.67            | 0.00015            |
|                                      | STD DEV | 0.913                     | 452.440               | 0.0                     | 0.061              | 30.16                | 0.195                 | 0.59              | 0.00016            |
| TAXI-IDLE                            | MEAN    | 8.755                     | 857.216               | 7.00                    | 1.021              | 100.01               | 10.131                | 101.50            | 0.01006            |
|                                      | STD DEV | 5.754                     | 114.788               | 0.0                     | 0.671              | 13.39                | 5.784                 | 0.06              | 0.00661            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 3.869              | 973.81               |                       | 1384.75           |                    |
|                                      |         |                           |                       | STD DEV:                | 2.481              | 67.79                |                       | 1.37              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 3.948              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.344              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 2.794              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.792              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.307              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.676              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 1.841                     | 857.216               | 19.00                   | 0.583               | 271.45               | 2.157                  | 275.50            | 0.00212             |
|                                      | STD DEV | 0.597                     | 114.788               | 0.0                     | 0.189               | 36.35                | 0.717                  | 0.54              | 0.00069             |
| TAKEOFF                              | MEAN    | 133.295                   | 8677.555              | 0.70                    | 1.555               | 101.24               | 15.344                 | 169.17            | 0.00919             |
|                                      | STD DEV | 33.587                    | 210.983               | 0.0                     | 0.397               | 2.45                 | 3.825                  | 0.11              | 0.00732             |
| CLIMBOUT                             | MEAN    | 86.972                    | 7171.270              | 2.20                    | 3.189               | 262.95               | 12.111                 | 451.92            | 0.00706             |
|                                      | STD DEV | 19.477                    | 160.470               | 0.0                     | 0.714               | 5.88                 | 2.631                  | 0.94              | 0.00158             |
| APPROACH                             | MEAN    | 20.242                    | 3572.512              | 4.00                    | 1.349               | 238.17               | 5.663                  | 386.67            | 0.00349             |
|                                      | STD DEV | 5.826                     | 452.440               | 0.0                     | 0.388               | 30.16                | 1.509                  | 0.59              | 0.00100             |
| TAXI-IDLE                            | MEAN    | 1.841                     | 857.216               | 7.00                    | 0.715               | 100.01               | 2.157                  | 101.50            | 0.00212             |
|                                      | STD DEV | 0.597                     | 114.788               | 0.0                     | 0.070               | 13.39                | 0.717                  | 0.06              | 0.00069             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 6.891               | 973.81               |                        | 1384.75           |                     |
|                                      |         |                           |                       | STD DEV:                | 1.651               | 67.79                |                        | 1.37              |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 7.076               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 1.692               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.977               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 1.192               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 107.249             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 27.024              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 39.563                    | 891.680               | 19.00                   | 12.528             | 282.37               | 45.370                | 266.00            | 0.04710            |
|                                      | STD DEV | 11.685                    | 213.480               | 0.0                     | 3.700              | 67.60                | 10.694                | 0.0               | 0.01391            |
| TAKEOFF                              | MEAN    | 18.544                    | 8407.422              | 0.70                    | 0.216              | 98.09                | 2.224                 | 163.33            | 0.00132            |
|                                      | STD DEV | 15.916                    | 181.373               | 0.0                     | 0.186              | 2.12                 | 1.961                 | 0.0               | 0.00114            |
| CLIMBOUT                             | MEAN    | 19.403                    | 7098.539              | 2.20                    | 0.711              | 260.28               | 2.759                 | 436.33            | 0.00163            |
|                                      | STD DEV | 14.506                    | 179.837               | 0.0                     | 0.532              | 6.60                 | 2.135                 | 0.0               | 0.00122            |
| APPROACH                             | MEAN    | 32.325                    | 3458.895              | 4.00                    | 2.155              | 230.59               | 9.468                 | 373.33            | 0.00577            |
|                                      | STD DEV | 9.911                     | 208.301               | 0.0                     | 0.661              | 13.89                | 3.253                 | 0.0               | 0.00177            |
| TAXI-IDLE                            | MEAN    | 39.563                    | 891.680               | 7.00                    | 4.616              | 104.03               | 45.370                | 98.00             | 0.04710            |
|                                      | STD DEV | 11.685                    | 213.480               | 0.0                     | 1.363              | 24.91                | 10.694                | 0.14              | 0.01391            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 20.227             | 975.35               |                       | 1337.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 5.222              | 105.89               |                       | 2.08              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 20.793             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.771              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 15.128             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.905              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 1.545              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.326              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 11.048                    | 891.680               | 19.00                   | 3.499              | 282.37               | 11.750                | 266.00            | 0.01315            |
|                                      | STD DEV | 6.439                     | 213.480               | 0.0                     | 2.039              | 67.60                | 5.415                 | 0.0               | 0.00767            |
| TAKEOFF                              | MEAN    | 0.316                     | 8407.422              | 0.70                    | 0.004              | 98.09                | 0.038                 | 163.33            | 0.00002            |
|                                      | STD DEV | 0.321                     | 181.373               | 0.0                     | 0.004              | 2.12                 | 0.039                 | 0.0               | 0.00002            |
| CLIMBOUT                             | MEAN    | 0.827                     | 7098.539              | 2.20                    | 0.030              | 260.28               | 0.117                 | 436.33            | 0.00007            |
|                                      | STD DEV | 1.042                     | 179.837               | 0.0                     | 0.038              | 6.60                 | 0.146                 | 0.0               | 0.00009            |
| APPROACH                             | MEAN    | 3.343                     | 3458.895              | 4.00                    | 0.223              | 230.59               | 0.977                 | 373.33            | 0.00060            |
|                                      | STD DEV | 2.180                     | 208.301               | 0.0                     | 0.145              | 13.89                | 0.656                 | 0.0               | 0.00039            |
| TAXI-IDLE                            | MEAN    | 11.048                    | 891.680               | 7.00                    | 1.289              | 104.03               | 11.750                | 98.00             | 0.01315            |
|                                      | STD DEV | 6.439                     | 213.480               | 0.0                     | 0.751              | 24.91                | 5.415                 | 0.14              | 0.00767            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 5.044              | 975.35               |                       | 1337.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 2.876              | 105.89               |                       | 2.08              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.026              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.627              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 3.773              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.151              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.263              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.268              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 2.908                     | 891.680               | 19.00                   | 0.921               | 282.37               | 3.156                 | 266.00            | 0.00346            |
|                                      | STD DEV | 1.454                     | 213.480               | 0.0                     | 0.460               | 67.60                | 1.016                 | 0.0               | 0.00173            |
| TAKEOFF                              | MEAN    | 151.272                   | 8407.422              | 0.70                    | 1.765               | 98.09                | 18.000                | 163.33            | 0.01081            |
|                                      | STD DEV | 21.703                    | 181.373               | 0.0                     | 0.253               | 2.12                 | 2.561                 | 0.0               | 0.00155            |
| CLIMBOUT                             | MEAN    | 100.144                   | 7098.539              | 2.20                    | 3.672               | 260.28               | 14.116                | 436.33            | 0.00842            |
|                                      | STD DEV | 19.169                    | 179.837               | 0.0                     | 0.703               | 6.60                 | 2.679                 | 0.0               | 0.00161            |
| APPROACH                             | MEAN    | 28.048                    | 3458.895              | 4.00                    | 1.870               | 230.59               | 8.128                 | 373.33            | 0.00501            |
|                                      | STD DEV | 3.055                     | 208.301               | 0.0                     | 0.204               | 13.89                | 0.957                 | 0.0               | 0.00055            |
| TAXI-IDLE                            | MEAN    | 2.908                     | 891.680               | 7.00                    | 0.339               | 104.03               | 3.156                 | 98.00             | 0.00346            |
|                                      | STD DEV | 1.454                     | 213.480               | 0.0                     | 0.170               | 24.91                | 1.016                 | 0.14              | 0.00173            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 8.567               | 975.35               |                       | 1337.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.082               | 105.89               |                       | 2.08              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 8.840               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.154               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.408               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.809               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 126.060             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 18.086              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 33.402                    | 959.329               | 19.00                   | 10.577             | 303.79               | 34.495                | 275.50            | 0.03800            |
|                                      | STD DEV | 17.385                    | 59.663                | 0.0                     | 5.505              | 18.91                | 15.561                | 9.73              | 0.01835            |
| TAKEOFF                              | MEAN    | 7.490                     | 8754.512              | 0.70                    | 0.087              | 102.14               | 0.855                 | 169.17            | 0.00052            |
|                                      | STD DEV | 5.447                     | 375.860               | 0.0                     | 0.064              | 4.38                 | 0.629                 | 5.95              | 0.00038            |
| CLIMBOUT                             | MEAN    | 8.892                     | 7336.766              | 2.20                    | 0.326              | 269.01               | 1.214                 | 451.91            | 0.00072            |
|                                      | STD DEV | 4.848                     | 266.697               | 0.0                     | 0.178              | 9.77                 | 0.671                 | 15.92             | 0.00040            |
| APPROACH                             | MEAN    | 18.184                    | 3408.656              | 4.00                    | 1.212              | 227.24               | 5.335                 | 386.67            | 0.00313            |
|                                      | STD DEV | 6.147                     | 167.198               | 0.0                     | 0.410              | 11.15                | 1.758                 | 13.61             | 0.00105            |
| TAXI-IDLE                            | MEAN    | 33.402                    | 959.329               | 7.00                    | 3.897              | 111.92               | 34.495                | 101.50            | 0.03800            |
|                                      | STD DEV | 17.385                    | 59.663                | 0.0                     | 2.028              | 6.96                 | 15.561                | 3.57              | 0.01835            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 16.100             | 1014.10              |                       | 1384.75           |                    |
|                                      |         |                           |                       | STD DEV:                | 7.611              | 42.47                |                       | 48.69             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 15.741             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 6.671              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 11.519             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.038              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.604              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.442              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 6.994                     | 959.329               | 19.00                   | 2.215              | 303.79               | 7.284                 | 275.50            | 0.00801            |
|                                      | STD DEV | 3.306                     | 59.663                | 0.0                     | 1.047              | 18.91                | 3.240                 | 9.73              | 0.00367            |
| TAKEOFF                              | MEAN    | 0.778                     | 8754.512              | 0.70                    | 0.009              | 102.14               | 0.087                 | 169.17            | 0.00005            |
|                                      | STD DEV | 1.094                     | 375.860               | 0.0                     | 0.013              | 4.38                 | 0.122                 | 5.95              | 0.00007            |
| CLIMBOUT                             | MEAN    | 0.921                     | 7336.766              | 2.20                    | 0.034              | 269.01               | 0.124                 | 451.91            | 0.00007            |
|                                      | STD DEV | 0.494                     | 266.697               | 0.0                     | 0.036              | 9.77                 | 0.134                 | 15.92             | 0.00008            |
| APPROACH                             | MEAN    | 1.753                     | 3408.656              | 4.00                    | 0.117              | 227.24               | 0.515                 | 386.67            | 0.00030            |
|                                      | STD DEV | 0.884                     | 167.198               | 0.0                     | 0.059              | 11.15                | 0.262                 | 13.61             | 0.00015            |
| TAXI-IDLE                            | MEAN    | 6.994                     | 959.329               | 7.00                    | 0.816              | 111.92               | 7.284                 | 101.50            | 0.00801            |
|                                      | STD DEV | 3.306                     | 59.663                | 0.0                     | 0.386              | 6.96                 | 3.240                 | 3.57              | 0.00367            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 3.190              | 1014.10              |                       | 1384.75           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.473              | 42.47                |                       | 48.69             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 3.139              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.388              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 2.295              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.027              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.613              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.862              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 2.913                     | 959.329               | 19.00                   | 0.923               | 303.79               | 3.051                 | 275.50            | 0.00334            |
|                                      | STD DEV | 1.232                     | 59.663                | 0.0                     | 0.390               | 18.91                | 1.252                 | 9.73              | 0.00139            |
| TAKEOFF                              | MEAN    | 197.742                   | 8754.512              | 0.70                    | 2.307               | 102.14               | 22.513                | 169.17            | 0.01360            |
|                                      | STD DEV | 35.161                    | 375.860               | 0.0                     | 0.410               | 4.38                 | 3.393                 | 5.95              | 0.00211            |
| CLIMBOUT                             | MEAN    | 131.017                   | 7336.766              | 2.20                    | 4.804               | 269.01               | 17.822                | 451.91            | 0.01061            |
|                                      | STD DEV | 19.775                    | 266.697               | 0.0                     | 0.725               | 9.77                 | 2.333                 | 15.92             | 0.00140            |
| APPROACH                             | MEAN    | 30.450                    | 3408.656              | 4.00                    | 2.057               | 227.24               | 9.055                 | 386.67            | 0.00532            |
|                                      | STD DEV | 4.724                     | 167.198               | 0.0                     | 0.315               | 11.15                | 1.307                 | 13.61             | 0.00081            |
| TAXI-IDLE                            | MEAN    | 2.913                     | 959.329               | 7.00                    | 0.340               | 111.92               | 3.051                 | 101.50            | 0.00334            |
|                                      | STD DEV | 1.232                     | 59.663                | 0.0                     | 0.144               | 6.96                 | 1.252                 | 3.57              | 0.00139            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 10.430              | 1014.10              |                       | 1384.75           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.594               | 42.47                |                       | 48.69             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 10.274              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.429               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 7.520               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.027               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 158.640             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 24.647              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 101.869                   | 1737.835              | 19.00                   | 32.259             | 550.31               | 58.124                | 988.88            | 0.03277            |
|                                      | STD DEV | 27.782                    | 192.909               | 0.0                     | 8.798              | 61.09                | 11.125                | 23.39             | 0.00956            |
| TAKEOFF                              | MEAN    | 8.291                     | 17052.313             | 0.70                    | 0.097              | 198.94               | 0.487                 | 520.46            | 0.00019            |
|                                      | STD DEV | 5.363                     | 821.375               | 0.0                     | 0.063              | 9.58                 | 0.320                 | 12.30             | 0.00012            |
| CLIMBOUT                             | MEAN    | 11.741                    | 14316.879             | 2.20                    | 0.430              | 524.95               | 0.823                 | 1390.38           | 0.00031            |
|                                      | STD DEV | 3.670                     | 820.809               | 0.0                     | 0.135              | 30.09                | 0.264                 | 32.86             | 0.00010            |
| APPROACH                             | MEAN    | 32.570                    | 5203.895              | 4.00                    | 2.171              | 346.93               | 6.419                 | 892.22            | 0.00243            |
|                                      | STD DEV | 11.269                    | 468.229               | 0.0                     | 0.751              | 31.21                | 2.808                 | 21.14             | 0.00080            |
| TAXI-IDLE                            | MEAN    | 101.869                   | 1737.835              | 7.00                    | 11.885             | 202.75               | 58.124                | 364.32            | 0.03277            |
|                                      | STD DEV | 27.782                    | 192.909               | 0.0                     | 3.241              | 22.51                | 11.125                | 8.60              | 0.00956            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 46.842             | 1823.88              |                       | 4156.26           |                    |
|                                      |         |                           |                       | STD DEV:                | 11.876             | 139.32               |                       | 98.25             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 25.512             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.061              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 11.316             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.081              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.218              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.143              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 27.313                    | 1737.835              | 19.00                   | 8.649              | 550.31               | 15.366                | 988.88            | 0.00881            |
|                                      | STD DEV | 22.277                    | 192.909               | 0.0                     | 7.054              | 61.09                | 11.403                | 23.39             | 0.00736            |
| TAKEOFF                              | MEAN    | 2.953                     | 17052.313             | 0.70                    | 0.034              | 198.94               | 0.173                 | 520.46            | 0.00007            |
|                                      | STD DEV | 2.215                     | 821.375               | 0.0                     | 0.026              | 9.58                 | 0.131                 | 12.30             | 0.00005            |
| CLIMBOUT                             | MEAN    | 2.647                     | 14316.879             | 2.20                    | 0.097              | 524.95               | 0.184                 | 1390.38           | 0.00007            |
|                                      | STD DEV | 1.806                     | 820.809               | 0.0                     | 0.066              | 30.09                | 0.127                 | 32.86             | 0.00005            |
| APPROACH                             | MEAN    | 2.997                     | 5203.895              | 4.00                    | 0.200              | 346.93               | 0.590                 | 892.22            | 0.00022            |
|                                      | STD DEV | 1.376                     | 468.229               | 0.0                     | 0.092              | 31.21                | 0.288                 | 21.14             | 0.00010            |
| TAXI-IDLE                            | MEAN    | 27.313                    | 1737.835              | 7.00                    | 3.187              | 202.75               | 15.366                | 364.32            | 0.00881            |
|                                      | STD DEV | 22.277                    | 192.909               | 0.0                     | 2.599              | 22.51                | 11.403                | 8.60              | 0.00736            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 12.167             | 1823.88              |                       | 4156.26           |                    |
|                                      |         |                           |                       | STD DEV:                | 9.768              | 139.32               |                       | 98.25             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 6.594              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.021              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 2.950              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.427              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.779              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.587              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 6.061                     | 1737.835              | 19.00                   | 1.919               | 550.31               | 3.497                  | 988.88            | 0.00194             |
|                                      | STD DEV | 2.194                     | 192.909               | 0.0                     | 0.695               | 61.09                | 1.210                  | 23.39             | 0.00070             |
| TAKEOFF                              | MEAN    | 719.951                   | 17052.313             | 0.70                    | 8.399               | 198.94               | 41.990                 | 520.46            | 0.01617             |
|                                      | STD DEV | 151.642                   | 821.375               | 0.0                     | 1.769               | 9.58                 | 7.069                  | 12.30             | 0.00359             |
| CLIMBOUT                             | MEAN    | 458.604                   | 14316.879             | 2.20                    | 16.815              | 524.95               | 31.892                 | 1390.38           | 0.01212             |
|                                      | STD DEV | 81.739                    | 820.809               | 0.0                     | 2.997               | 30.09                | 4.201                  | 32.86             | 0.00233             |
| APPROACH                             | MEAN    | 54.101                    | 5203.895              | 4.00                    | 3.607               | 346.93               | 10.457                 | 892.22            | 0.00404             |
|                                      | STD DEV | 5.727                     | 468.229               | 0.0                     | 0.382               | 31.21                | 1.323                  | 21.14             | 0.00044             |
| TAXI-IDLE                            | MEAN    | 6.061                     | 1737.835              | 7.00                    | 0.707               | 202.75               | 3.497                  | 364.32            | 0.00194             |
|                                      | STD DEV | 2.194                     | 192.909               | 0.0                     | 0.256               | 22.51                | 1.210                  | 8.60              | 0.00070             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 31.448              | 1823.88              |                        | 4156.26           |                     |
|                                      |         |                           |                       | STD DEV:                | 5.129               | 139.32               |                        | 98.25             |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 17.227              |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 2.231               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 7.581               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 1.333               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 188.690             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 41.875              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 60.173                    | 661.542               | 19.00                   | 19.055             | 209.49               | 89.861                | 144.40            | 0.13196            |
|                                      | STD DEV | 19.601                    | 110.889               | 0.0                     | 6.207              | 35.12                | 20.325                | 0.0               | 0.04298            |
| TAKEOFF                              | MEAN    | 14.218                    | 7625.230              | 0.70                    | 0.166              | 88.96                | 1.870                 | 133.00            | 0.00125            |
|                                      | STD DEV | 2.944                     | 150.022               | 0.0                     | 0.034              | 1.75                 | 0.426                 | 0.25              | 0.00026            |
| CLIMBOUT                             | MEAN    | 15.251                    | 6354.934              | 2.20                    | 0.559              | 233.01               | 2.401                 | 355.30            | 0.00157            |
|                                      | STD DEV | 1.804                     | 60.839                | 0.0                     | 0.066              | 2.24                 | 0.298                 | 0.0               | 0.00019            |
| APPROACH                             | MEAN    | 39.068                    | 3051.668              | 4.00                    | 2.605              | 203.44               | 12.868                | 304.00            | 0.00857            |
|                                      | STD DEV | 10.078                    | 123.028               | 0.0                     | 0.672              | 8.21                 | 3.550                 | 0.0               | 0.00221            |
| TAXI-IDLE                            | MEAN    | 60.173                    | 661.542               | 7.00                    | 7.020              | 77.18                | 89.861                | 53.20             | 0.13196            |
|                                      | STD DEV | 19.601                    | 110.889               | 0.0                     | 2.287              | 12.94                | 20.325                | 0.0               | 0.04298            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 29.405             | 812.09               |                       | 989.90            |                    |
|                                      |         |                           |                       | STD DEV:                | 9.054              | 43.96                |                       | 0.0               |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 35.942             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 9.707              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 29.705             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 9.147              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 1.455              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.301              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 66.051                    | 661.542               | 19.00                   | 20.916             | 209.49               | 102.865               | 144.40            | 0.14485            |
|                                      | STD DEV | 11.083                    | 110.889               | 0.0                     | 3.510              | 35.12                | 28.897                | 0.0               | 0.02430            |
| TAKEOFF                              | MEAN    | 0.0                       | 7625.230              | 0.70                    | 0.0                | 88.96                | 0.0                   | 133.00            | 0.0                |
|                                      | STD DEV | 0.0                       | 150.022               | 0.0                     | 0.0                | 1.75                 | 0.0                   | 0.25              | 0.0                |
| CLIMBOUT                             | MEAN    | 0.242                     | 6354.934              | 2.20                    | 0.009              | 233.01               | 0.038                 | 355.30            | 0.00003            |
|                                      | STD DEV | 0.221                     | 60.839                | 0.0                     | 0.008              | 2.24                 | 0.035                 | 0.0               | 0.00002            |
| APPROACH                             | MEAN    | 4.224                     | 3051.668              | 4.00                    | 0.282              | 203.44               | 1.394                 | 304.00            | 0.00093            |
|                                      | STD DEV | 4.447                     | 123.028               | 0.0                     | 0.296              | 8.21                 | 1.451                 | 0.0               | 0.00098            |
| TAXI-IDLE                            | MEAN    | 66.051                    | 661.542               | 7.00                    | 7.706              | 77.18                | 102.865               | 53.20             | 0.14485            |
|                                      | STD DEV | 11.083                    | 110.889               | 0.0                     | 1.293              | 12.94                | 28.897                | 0.0               | 0.02430            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 29.912             | 812.09               |                       | 989.90            |                    |
|                                      |         |                           |                       | STD DEV:                | 4.547              | 43.96                |                       | 0.0               |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 35.776             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 6.654              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 29.207             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.588              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.0                |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.0                |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 0.849                     | 661.542               | 19.00                   | 0.269               | 209.49               | 1.271                 | 144.40            | 0.00186            |
|                                      | STD DEV | 0.381                     | 110.889               | 0.0                     | 0.121               | 35.12                | 0.501                 | 0.0               | 0.00084            |
| TAKEOFF                              | MEAN    | 153.012                   | 7625.230              | 0.70                    | 1.785               | 88.96                | 20.081                | 133.00            | 0.01342            |
|                                      | STD DEV | 9.845                     | 150.022               | 0.0                     | 0.115               | 1.75                 | 1.519                 | 0.25              | 0.00086            |
| CLIMBOUT                             | MEAN    | 114.759                   | 6354.934              | 2.20                    | 4.208               | 233.01               | 18.073                | 355.30            | 0.01184            |
|                                      | STD DEV | 13.774                    | 60.839                | 0.0                     | 0.503               | 2.24                 | 2.316                 | 0.0               | 0.00142            |
| APPROACH                             | MEAN    | 30.446                    | 3051.668              | 4.00                    | 2.030               | 203.44               | 9.939                 | 304.00            | 0.00668            |
|                                      | STD DEV | 5.197                     | 123.028               | 0.0                     | 0.346               | 8.21                 | 1.331                 | 0.0               | 0.00114            |
| TAXI-IDLE                            | MEAN    | 0.849                     | 661.542               | 7.00                    | 0.099               | 77.18                | 1.271                 | 53.20             | 0.00186            |
|                                      | STD DEV | 0.381                     | 110.889               | 0.0                     | 0.044               | 12.94                | 0.501                 | 0.0               | 0.00084            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 8.391               | 812.09               |                       | 989.90            |                    |
|                                      |         |                           |                       | STD DEV:                | 0.842               | 43.96                |                       | 0.0               |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 10.397              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.524               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 8.476               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.850               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 156.591             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 10.075              |                      |                       |                   |                    |

DATE: 6/17/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 1 ENGINE TYPE AND MODEL: Y56-A7B SERIAL NUMBER: AE-102635

RATED HORSEPOWER: 3755.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS

N2 COMPRESSOR OVERHAUL: -0. HRS

COMBUSTOR CAN REPLACEMENT: 0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS

N1 TURBINE OVERHAUL: 0. HRS

N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4

FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 90.00

ATMOSPHERIC PRESSURE: START 28.93 FINISH 28.93

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0186

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 8

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION 2ND LAST RUN  
SHP DATA WAS BACK-CALCULATED

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPK | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 1/ 0      | 2268.00            | 60                       | 13800.00         | -0.00                    | 1450.00                 | 30.00    | 0.013400                            | -0.00                     | 1510.00                      |
| 5.00         | 2/ 1      | 3238.00            | 86                       | 13800.00         | -0.00                    | 1800.00                 | 30.00    | 0.016700                            | -0.00                     | 1700.00                      |
| 10.50        | 3/ 2      | 3502.00            | 93                       | 13800.00         | -0.00                    | 1450.00                 | 30.00    | 0.013400                            | -0.00                     | 1510.00                      |
| 15.00        | 4/ 3      | -0.00              | 0                        | 13300.00         | -0.00                    | 820.00                  | 27.90    | 0.008200                            | -0.00                     | 1128.00                      |
| 18.00        | 5/ 4      | -0.00              | 0                        | 14000.00         | -0.00                    | 2050.00                 | 30.80    | 0.018500                            | -0.00                     | 1860.00                      |
| 19.50        | 4/ 5      | -0.00              | 0                        | 13400.00         | -0.00                    | 810.00                  | 28.40    | 0.007900                            | -0.00                     | 1120.00                      |
| 21.00        | 7/ 4      | -0.00              | 0                        | 9950.00          | -0.00                    | 560.00                  | 14.70    | 0.010600                            | -0.00                     | 1150.00                      |
| 24.00        | 8/ 7      | -0.00              | 0                        | 13300.00         | -0.00                    | 705.00                  | 27.90    | 0.007000                            | -0.00                     | 1050.00                      |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 60                       | -0.00                      | -0.00                     | 31.00         | 2.57                 | 0.0            | -0.00         | -0.00           | 81.00           | -0.00     | -0.00 | -0.00        |
| 86                       | -0.00                      | -0.00                     | 28.00         | 3.06                 | 0.0            | -0.00         | -0.00           | 115.00          | -0.00     | -0.00 | -0.00        |
| 93                       | -0.00                      | -0.00                     | 26.00         | 3.29                 | 0.0            | -0.00         | -0.00           | 124.00          | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 28.00         | 1.55                 | 0.0            | -0.00         | -0.00           | 32.00           | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 24.00         | 3.74                 | 0.0            | -0.00         | -0.00           | 127.00          | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 28.00         | 1.57                 | 0.0            | -0.00         | -0.00           | 32.00           | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 287.00        | 2.13                 | 235.00         | -0.00         | -0.00           | 28.00           | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 30.00         | 1.40                 | 2.00           | -0.00         | -0.00           | 26.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 60                       | 2.41                      | 0.0                       | -0.00                      | 3135.09                    | -0.00                     | 10.33                      | 3.49              | 0.0               | -0.00              | 4545.88            | -0.00             | 14.98              |
| 86                       | 1.83                      | 0.0                       | -0.00                      | 3136.00                    | -0.00                     | 12.32                      | 3.29              | 0.0               | -0.00              | 5644.80            | -0.00             | 22.18              |
| 93                       | 1.58                      | 0.0                       | -0.00                      | 3136.39                    | -0.00                     | 12.36                      | 2.29              | 0.0               | -0.00              | 4547.77            | -0.00             | 17.92              |
| 0                        | 3.60                      | 0.0                       | -0.00                      | 3133.21                    | -0.00                     | 6.76                       | 2.95              | 0.0               | -0.00              | 2569.23            | -0.00             | 5.55               |
| 0                        | 1.28                      | 0.0                       | -0.00                      | 3136.86                    | -0.00                     | 11.14                      | 2.63              | 0.0               | -0.00              | 6430.55            | -0.00             | 22.83              |
| 0                        | 3.56                      | 0.0                       | -0.00                      | 3133.28                    | -0.00                     | 6.68                       | 2.88              | 0.0               | -0.00              | 2537.96            | -0.00             | 5.41               |
| 0                        | 26.27                     | 12.32                     | -0.00                      | 3063.79                    | -0.00                     | 4.21                       | 14.71             | 6.90              | -0.00              | 1715.72            | -0.00             | 2.36               |
| 0                        | 4.27                      | 0.16                      | -0.00                      | 3131.72                    | -0.00                     | 6.08                       | 3.01              | 0.11              | -0.00              | 2207.86            | -0.00             | 4.29               |

| POWER PERCENT RATED T.O. | CO LB/1K HP-HR | CO 2 LB/1K HP-HR | THC LB/1K HP-HR | NO LB/1K HP-HR | NO 2 LB/1K HP-HR | NO X LB/1K HP-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 60                       | 1.539          | 2004.356         | 0.0             | -0.000         | -0.000           | 6.604            |
| 86                       | 1.015          | 1743.298         | 0.0             | -0.000         | -0.000           | 6.849            |
| 93                       | 0.653          | 1298.621         | 0.0             | -0.000         | -0.000           | 5.117            |

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*  
 \*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*  
 \*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*  
 \*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*  
 \*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

DATE: 7/26/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 137 ENGINE TYPE AND MODEL: JT 3C - 7 SERIAL NUMBER: 633734  
RATED THRUST: 12000.

ENGINE TOTAL TIME: 18499. HRS

TIME SINCE HOT SECTION OVERHAUL: 2614. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 2614. HRS  
N2 COMPRESSOR OVERHAUL: 2614. HRS  
COMBUSTOR CAN REPLACEMENT: 2614. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 2614. HRS  
N1 TURBINE OVERHAUL: 2614. HRS  
N2 TURBINE OVERHAUL: 2614. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 57.20 FINISH 57.20

ATMOSPHERIC PRESSURE: START 29.94 FINISH 29.93

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0094

RELATIVE HUMIDITY: 94.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 3

COMMENTS:

ENGINE OVERHAULED AND CARBO - BLASTED  
80 PROBE USED FOR SAMPLING  
EXHAUST GAS TEMPERATURE IN DEGREES C  
EXHAUST GAS PRESSURE IN INCHES HG.

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.73       | 1/ 0      | 7834.00            | 65                       | 5816.00          | 9164.00                  | 6369.00                 | -0.00    | -0.000000                           | -0.00                     | 2.14                         |
| 737.00     | 2/ 1      | 9169.00            | 76                       | 6055.00          | 9381.00                  | 7465.00                 | -0.00    | -0.000000                           | -0.00                     | 2.36                         |
| 742.00     | 3/ 2      | 10961.00           | 91                       | 6416.00          | 9699.00                  | 9186.00                 | -0.00    | -0.000000                           | -0.00                     | 2.66                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 65                       | 464.00                     | 62.60                     | 60.00         | 2.30                 | 2.85           | 50.40         | -0.00           | 43.00           | -0.00     | -0.00 | -0.00        |
| 76                       | 508.00                     | 68.70                     | 58.00         | 2.50                 | 2.40           | 62.00         | -0.00           | 64.20           | -0.00     | -0.00 | -0.00        |
| 91                       | 576.00                     | 76.80                     | 30.00         | 2.80                 | 0.90           | 84.00         | -0.00           | 88.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|
| 65                       | 5.23                      | 0.14                      | -0.00                      | 3147.29                    | 7.21                      | 6.15                       | 31.28                     | 0.91                      | -0.00                      | 20045.09                   | 45.92                     | 34.19                      |
| 76                       | 4.65                      | 0.11                      | -0.00                      | 3148.28                    | 8.16                      | 8.45                       | 34.70                     | 0.82                      | -0.00                      | 23501.93                   | 60.93                     | 63.09                      |
| 91                       | 2.15                      | 0.04                      | -0.00                      | 3152.41                    | 9.89                      | 10.36                      | 19.75                     | 0.34                      | -0.00                      | 28958.03                   | 90.42                     | 95.14                      |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 65                       | 4.248          | 2558.730         | 0.116           | 5.862          | -0.000           | 5.011            |
| 76                       | 3.785          | 2563.194         | 0.090           | 6.645          | -0.000           | 6.811            |
| 91                       | 1.802          | 2641.915         | 0.031           | 8.286          | -0.000           | 8.610            |

DATE: 7/ 7/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 64 ENGINE TYPE AND MODEL: JT3D SERIAL NUMBER: P-668816  
RATED THRUST: 21000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 29.92 FINISH 29.94

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0084

RELATIVE HUMIDITY: 27.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 9

COMMENTS:

BURNER : 8M

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1429.00    | 1/ 0      | 840.00             | 3                        | 1865.00          | 5495.00                  | 1017.00                 | 29.09    | 0.009710                            | -0.00                     | 1.02                         |
| 1443.00    | 2/ 1      | 1350.00            | 6                        | 2365.00          | 6440.00                  | 1266.00                 | 40.70    | 0.008640                            | -0.00                     | 1.04                         |
| 1443.00    | 3/ 2      | 1850.00            | 8                        | 2745.00          | 7025.00                  | 1501.00                 | 49.26    | 0.008460                            | -0.00                     | 1.05                         |
| 1453.00    | 4/ 3      | 6279.00            | 29                       | 4470.00          | 8510.00                  | 3197.00                 | 97.66    | 0.009070                            | -0.00                     | 1.20                         |
| 1512.00    | 5/ 4      | 9597.00            | 45                       | 5245.00          | 9020.00                  | 4559.00                 | 125.93   | 0.010280                            | -0.00                     | 1.34                         |
| 1518.00    | 6/ 5      | 11606.00           | 55                       | 5615.00          | 9260.00                  | 5636.00                 | 140.66   | 0.011130                            | -0.00                     | 1.44                         |
| 1529.00    | 7/ 6      | 13564.00           | 64                       | 5950.00          | 9475.00                  | 6705.00                 | 155.27   | 0.012000                            | -0.00                     | 1.55                         |
| 1541.00    | 8/ 7      | 15550.00           | 74                       | 6280.00          | 9695.00                  | 7924.00                 | 170.32   | 0.012920                            | -0.00                     | 1.68                         |
| 1551.00    | 9/ 8      | 17609.00           | 83                       | 6700.00          | 10000.00                 | 9450.00                 | 183.25   | 0.014320                            | -0.00                     | 1.84                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 3                        | 585.00                     | 15.00                     | 867.60        | 1.28                 | 1055.80        | 1.90          | 4.00            | 5.90            | -0.00     | -0.00 | -0.00        |
| 6                        | 595.00                     | 15.19                     | 645.60        | 1.41                 | 459.80         | 1.00          | 5.30            | 6.30            | -0.00     | -0.00 | -0.00        |
| 8                        | 605.00                     | 15.38                     | 455.70        | 1.48                 | 222.00         | 4.10          | 5.10            | 9.20            | -0.00     | -0.00 | -0.00        |
| 29                       | 659.00                     | 17.39                     | 93.50         | 1.77                 | 14.30          | 28.90         | 10.00           | 38.90           | -0.00     | -0.00 | -0.00        |
| 45                       | 725.00                     | 19.36                     | 41.50         | 2.18                 | 2.00           | 0.0           | 2.90            | 2.90            | -0.00     | -0.00 | -0.00        |
| 55                       | 770.00                     | 20.73                     | 27.20         | 2.37                 | 5.70           | 0.0           | 5.40            | 5.40            | -0.00     | -0.00 | -0.00        |
| 64                       | 825.00                     | 22.20                     | 19.70         | 2.56                 | 3.30           | 0.0           | 6.30            | 6.30            | -0.00     | -0.00 | -0.00        |
| 74                       | 885.00                     | 24.12                     | 14.30         | 2.77                 | 5.60           | 0.0           | 17.10           | 17.10           | -0.00     | -0.00 | -0.00        |
| 83                       | 980.00                     | 26.24                     | 10.70         | 3.13                 | 4.50           | 0.0           | 8.40            | 8.40            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 3                        | 117.68                    | 82.02                     | 0.89                       | 2727.85                    | 0.42                      | 1.31                       | 119.68            | 83.41             | 0.91               | 2774.22            | 0.43              | 1.34               |
| 6                        | 84.79                     | 34.59                     | 1.14                       | 2909.64                    | 0.22                      | 1.36                       | 107.34            | 43.79             | 1.45               | 3683.60            | 0.27              | 1.72               |
| 8                        | 58.80                     | 16.40                     | 1.08                       | 3000.36                    | 0.87                      | 1.95                       | 88.25             | 24.62             | 1.62               | 4503.54            | 1.30              | 2.93               |
| 29                       | 10.49                     | 0.92                      | 1.84                       | 3118.75                    | 5.32                      | 7.17                       | 33.52             | 2.94              | 5.89               | 9970.64            | 17.02             | 22.91              |
| 45                       | 3.79                      | 0.10                      | 0.44                       | 3131.50                    | 0.0                       | 0.44                       | 17.30             | 0.48              | 1.99               | 14276.50           | 0.0               | 1.99               |
| 55                       | 2.29                      | 0.27                      | 0.75                       | 3133.40                    | 0.0                       | 0.75                       | 12.90             | 1.55              | 4.21               | 17659.81           | 0.0               | 4.21               |
| 64                       | 1.54                      | 0.15                      | 0.81                       | 3134.93                    | 0.0                       | 0.81                       | 10.29             | 0.99              | 5.41               | 21019.68           | 0.0               | 5.41               |
| 74                       | 1.03                      | 0.23                      | 2.02                       | 3135.49                    | 0.0                       | 2.02                       | 8.16              | 1.83              | 16.03              | 24845.64           | 0.0               | 16.03              |
| 83                       | 0.68                      | 0.16                      | 0.88                       | 3136.22                    | 0.0                       | 0.88                       | 6.45              | 1.55              | 8.31               | 29637.29           | 0.0               | 8.31               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 3                        | 142.473        | 3302.639         | 99.298          | 0.512          | 1.079            | 1.591            |
| 6                        | 79.514         | 2728.595         | 32.434          | 0.202          | 1.072            | 1.275            |
| 8                        | 47.705         | 2434.344         | 13.310          | 0.705          | 0.877            | 1.582            |
| 29                       | 5.339          | 1587.935         | 0.468           | 2.710          | 0.938            | 3.648            |
| 45                       | 1.802          | 1487.600         | 0.050           | 0.0            | 0.207            | 0.207            |
| 55                       | 1.111          | 1521.611         | 0.133           | 0.0            | 0.362            | 0.362            |
| 64                       | 0.759          | 1549.667         | 0.073           | 0.0            | 0.399            | 0.399            |
| 74                       | 0.525          | 1597.790         | 0.118           | 0.0            | 1.031            | 1.031            |
| 83                       | 0.366          | 1683.077         | 0.088           | 0.0            | 0.472            | 0.472            |

DATE: 6/29/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 121 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: 669474  
RATED THRUST: 18000.  
ENGINE TOTAL TIME: 9199. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 9199. HRS  
N2 COMPRESSOR OVERHAUL: 12169. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 68.00 FINISH 66.20  
ATMOSPHERIC PRESSURE: START 29.98 FINISH 30.35  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0105  
RELATIVE HUMIDITY: 72.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50  
SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 4

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1327.00    | 1/ 0      | 9200.00                  | 51                 | 5179.00          | 8993.00 | 4857.00 | -0.00                    | -0.000000               | -0.00    | 1.37                                | -0.00                     |                              |
| 1335.00    | 2/ 1      | 13250.00                 | 73                 | 5910.00          | 9484.00 | 7145.00 | -0.00                    | -0.000000               | -0.00    | 1.61                                | -0.00                     |                              |
| 1339.00    | 3/ 2      | 16650.00                 | 92                 | 6475.00          | 9886.00 | 9467.00 | -0.00                    | -0.000000               | -0.00    | 1.84                                | -0.00                     |                              |
| 1447.00    | 4/ 3      | 1000.00                  | 5                  | 1999.00          | 5810.00 | 1180.00 | -0.00                    | -0.000000               | -0.00    | -0.00                               | -0.00                     |                              |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 51                       | 721.40                     | 40.80                     | 130.00        | 2.28                 | 14.40          | 45.00         | -0.00           | 47.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 838.40                     | 47.60                     | 80.00         | 2.66                 | 3.60           | 73.20         | -0.00           | 74.00           | -0.00     | -0.00 | -0.00        |
| 92                       | 957.20                     | 54.70                     | 60.00         | 3.10                 | 3.00           | -0.00         | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 555.80                     | 31.00                     | 900.00        | 1.55                 | -0.00          | 3.00          | -0.00           | 3.50            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 51                       | 11.38                     | 0.72                      | -0.00                      | 3136.03                    | 6.47                      | 6.76                       | 55.27             | 3.51              | -0.00              | 15231.69           | 31.43             | 32.82              |
| 73                       | 6.02                      | 0.16                      | -0.00                      | 3146.00                    | 9.05                      | 9.15                       | 43.03             | 1.11              | -0.00              | 22478.18           | 64.67             | 65.37              |
| 92                       | 3.88                      | 0.11                      | -0.00                      | 3149.49                    | -0.00                     | -0.00                      | 36.73             | 1.05              | -0.00              | 29816.21           | -0.00             | -0.00              |
| 5                        | 110.23                    | -0.00                     | -0.00                      | 2982.70                    | 0.60                      | 0.70                       | 130.07            | -0.00             | -0.00              | 3519.58            | 0.71              | 0.83               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 51                       | 6.008          | 1655.619         | 0.381           | 3.416          | -0.000           | 3.564            |
| 73                       | 3.247          | 1696.467         | 0.084           | 4.880          | -0.000           | 4.934            |
| 92                       | 2.206          | 1790.764         | 0.063           | -0.000         | -0.000           | -0.000           |
| 5                        | 130.066        | 3519.585         | -0.000          | 0.712          | -0.000           | 0.831            |

DATE: 8/ 4/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 313 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: P643558B  
 RATED THRUST: 18000.  
 ENGINE TOTAL TIME: 4158. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 4158. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 4158. HRS  
 N2 COMPRESSOR OVERHAUL: 4158. HRS  
 COMBUSTOR CAN REPLACEMENT: 4158. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 4158. HRS  
 N1 TURBINE OVERHAUL: 4158. HRS  
 N2 TURBINE OVERHAUL: 4158. HRS  
 FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 68.00 FINISH 67.00  
 ATMOSPHERIC PRESSURE: START 29.05 FINISH 29.05  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0116  
 RELATIVE HUMIDITY: 76.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50  
 SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. THIS IS THE FIRST OF THREE TESTS ON THIS ENGINE THE FUEL USED CONTAINED NO CI-2. HYDROCARBON EMISSIONS FROM THIS ENGINE WERE ABNORMALLY HIGH DUE TO AN OIL LEAK. NO HYDROCARBON DATA ARE THUS REPORTED FOR THIS TEST.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | N1      | N2      | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DFGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|---------|---------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 6/ 0      | 9000.00            | 50                       | 5380.00          | 9160.00 | 5010.00 | 126.20                   | 0.011000                | -0.00    | 1.17                                | -0.00                     | -0.00                        |
| 5.00         | 1/ 6      | 11180.00           | 62                       | 5830.00          | 9370.00 | 6310.00 | 143.60                   | 0.012200                | -0.00    | -0.00                               | -0.00                     | -0.00                        |
| 7.00         | 2/ 1      | 13300.00           | 73                       | 6200.00          | 9930.00 | 7610.00 | 160.00                   | 0.013200                | -0.00    | -0.00                               | -0.00                     | -0.00                        |
| 11.00        | 3/ 2      | 15420.00           | 85                       | 6550.00          | 9930.00 | 9330.00 | 174.40                   | 0.014800                | -0.00    | -0.00                               | -0.00                     | -0.00                        |
| 15.00        | 4/ 3      | 960.00             | 5                        | -0.00            | 5890.00 | 1000.00 | 30.80                    | 0.009000                | -0.00    | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 50                       | 716.00                     | 4.60                      | 47.00         | 2.24                 | 26.00          | 33.00         | 2.00            | 35.00           | -0.00     | -0.00 | -0.00        |
| 62                       | 777.00                     | 6.50                      | 25.00         | 2.48                 | 26.00          | 43.00         | 3.00            | 46.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 844.00                     | 8.50                      | 12.00         | 2.69                 | 26.00          | 57.00         | 4.00            | 61.00           | -0.00     | -0.00 | -0.00        |
| 85                       | 939.00                     | 10.90                     | 11.00         | 0.01                 | 16.00          | 83.00         | 2.00            | 85.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 536.00                     | 0.30                      | 627.00        | 1.68                 | 1240.00        | 3.00          | 5.00            | 8.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 50                       | 4.17                      | 1.32                      | 0.29                       | 3123.06                    | 4.81                      | 5.10                       | 20.89             | 6.62              | 1.46               | 15646.54           | 24.10             | 25.56              |
| 62                       | 2.01                      | 1.19                      | 0.40                       | 3126.81                    | 5.67                      | 6.06                       | 12.66             | 7.54              | 2.50               | 19730.18           | 35.76             | 38.26              |
| 73                       | 0.89                      | 1.10                      | 0.49                       | 3128.82                    | 6.93                      | 7.42                       | 6.76              | 8.39              | 3.70               | 23810.33           | 52.74             | 56.44              |
| 85                       | 172.72                    | 143.89                    | 51.58                      | 2467.12                    | 2140.67                   | 2192.26                    | 1611.48           | 1342.45           | 481.26             | 23018.21           | 19972.47          | 20453.74           |
| 5                        | 66.98                     | 75.87                     | 0.88                       | 2819.87                    | 0.53                      | 1.40                       | 66.98             | 75.87             | 0.88               | 2819.87            | 0.53              | 1.40               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 50                       | 2.322          | 1738.505         | 0.736           | 2.677          | 0.162            | 2.840            |
| 62                       | 1.132          | 1764.775         | 0.674           | 3.199          | 0.223            | 3.422            |
| 73                       | 0.508          | 1790.250         | 0.631           | 3.966          | 0.278            | 4.244            |
| 85                       | 104.506        | 1492.750         | 87.059          | 1295.232       | 31.210           | 1326.442         |
| 5                        | 69.771         | 2937.363         | 79.027          | 0.548          | 0.914            | 1.462            |

DATE: 8/ 4/71

TEST ORGANIZATION: S W R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA .....

CAL ID NUMBER: 314 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: P6435588

RATED THRUST: 18000.

ENGINE TOTAL TIME: 4158. HRS

TIME SINCE HOT SECTION OVERHAUL: 4158. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 4158. HRS  
N2 COMPRESSOR OVERHAUL: 4158. HRS  
COMBUSTOR CAN REPLACEMENT: 4158. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 4158. HRS  
N1 TURBINE OVERHAUL: 4158. HRS  
N2 TURBINE OVERHAUL: 4158. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 66.00 FINISH 66.00

ATMOSPHERIC PRESSURE: START 29.04 FINISH 29.04

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0124

RELATIVE HUMIDITY: 81.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. THIS IS THE SECOND OF THREE TESTS ON THIS ENGINE. THE FUEL USED CONTAINED 0.1% BY VOLUME C1-2. HYDROCARBON DATA ARE NOT REPORTED BECAUSE OF AN OIL LEAK.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS CFM AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGR F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGR F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|----------------------------------|---------------------------|---------------------------|
| 0.0          | 6/ 0      | 9080.00            | 50                       | 5390.00          | 9020.00                  | 5100.00                 | 127.30   | 0.011100                         | -0.00                     | 1.37                      |
| 6.00         | 1/ 6      | 11200.00           | 62                       | 5830.00          | 9370.00                  | 6300.00                 | 143.70   | 0.012200                         | -0.00                     | -0.00                     |
| 10.00        | 2/ 1      | 13420.00           | 74                       | 6210.00          | 9630.00                  | 7660.00                 | 161.00   | 0.013200                         | -0.00                     | -0.00                     |
| 13.00        | 3/ 2      | 15500.00           | 86                       | 6660.00          | 9930.00                  | 9340.00                 | 175.40   | 0.014800                         | -0.00                     | -0.00                     |
| 16.00        | 4/ 3      | 980.00             | 5                        | 2020.00          | 5880.00                  | 1030.00                 | 31.80    | 0.009000                         | -0.00                     | -0.00                     |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGR F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 50                       | 725.00                  | 4.80                      | 66.00         | 2.22                 | -0.00          | 31.00         | 2.00            | 33.00           | -0.00     | -0.00 | -0.00        |
| 62                       | 775.00                  | 6.50                      | 34.00         | 2.48                 | -0.00          | 42.00         | 2.00            | 44.00           | -0.00     | -0.00 | -0.00        |
| 74                       | 844.00                  | 8.50                      | 16.00         | 2.68                 | -0.00          | 55.00         | 3.00            | 58.00           | -0.00     | -0.00 | -0.00        |
| 86                       | 937.00                  | 10.90                     | 11.00         | 2.99                 | -0.00          | 77.00         | 3.00            | 80.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 540.00                  | 0.30                      | 674.00        | 1.66                 | -0.00          | 4.00          | 4.00            | 8.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NH LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 50                       | 5.91                      | -0.00                     | 0.29                       | 3123.95                    | 4.56                      | 4.85                       | 30.15             | -0.00             | 1.50               | 15932.16           | 23.26             | 24.76              |
| 62                       | 2.73                      | -0.00                     | 0.26                       | 3128.95                    | 5.54                      | 5.80                       | 17.20             | -0.00             | 1.66               | 19712.39           | 34.90             | 16.56              |
| 74                       | 1.19                      | 1.19                      | 0.37                       | 3128.10                    | 6.71                      | 7.08                       | 9.10              | 9.13              | 2.80               | 23961.28           | 41.41             | 54.21              |
| 86                       | 0.73                      | -0.00                     | 0.33                       | 3132.09                    | 8.43                      | 8.76                       | 6.85              | -0.00             | 3.07               | 29253.70           | 79.76             | 81.82              |
| 5                        | 77.81                     | -0.00                     | 0.76                       | 3010.99                    | 0.76                      | 1.52                       | 80.14             | -0.00             | 0.78               | 3101.32            | 0.78              | 1.56               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 50                       | 3.320          | 1754.644         | -0.000          | 2.561          | 0.165            | 2.727            |
| 62                       | 1.536          | 1760.035         | -0.000          | 3.116          | 0.146            | 3.264            |
| 74                       | 0.678          | 1785.490         | 0.680           | 3.831          | 0.209            | 4.040            |
| 86                       | 0.442          | 1887.335         | -0.000          | 5.081          | 0.199            | 5.279            |
| 5                        | 81.777         | 3164.609         | -0.000          | 0.797          | 0.797            | 1.594            |

DATE: 8/ 4/71

TEST ORGANIZATION: S M R I TWA

ENGINE SUPPLIER: T W A

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 315 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: P6435588

RATED THRUST: 18000.

ENGINE TOTAL TIME: 4158. HRS

TIME SINCE HOT SECTION OVERHAUL: 4158. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 4158. HRS  
N2 COMPRESSOR OVERHAUL: 4158. HRS  
COMBUSTOR CAN REPLACEMENT: 4158. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 4158. HRS  
N1 TURBINE OVERHAUL: 4158. HRS  
N2 TURBINE OVERHAUL: 4158. HRS

FUEL: JP-4 TF FUEL H/C RATIO: 2.020

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 66.00 FINISH 66.00

ATMOSPHERIC PRESSURE: START 29.04 FINISH 29.04

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0124

RELATIVE HUMIDITY: 81.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 5

COMMENTS:

NO2 DETERMINED BY SUBTRACTION. THIS TEST IS THE LAST OF THREE TESTS RUN ON THIS ENGINE. THE FUEL USED CONTAINED 0.0125% CI-2 BY VOLUME. HYDROCARBON DATA ARE NOT REPORTED BECAUSE OF AN OIL LEAK.

| ELAPSED TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 6/ 0      | 9000.00            | 50                       | 5350.00          | 9020.00                  | 5120.00                 | 126.30   | 0.011300                            | -0.00                     | 1.37                         |
| 5.00         | 1/ 6      | 11250.00           | 62                       | 5830.00          | 9480.00                  | 6320.00                 | 143.70   | 0.012200                            | -0.00                     | -0.00                        |
| 9.00         | 2/ 1      | 13250.00           | 73                       | 6200.00          | 9630.00                  | 7610.00                 | 160.00   | 0.013200                            | -0.00                     | -0.00                        |
| 11.30        | 3/ 2      | 15460.00           | 85                       | 6660.00          | 9950.00                  | 9360.00                 | 175.40   | 0.014800                            | -0.00                     | -0.00                        |
| 13.00        | 4/ 3      | 980.00             | 5                        | 2015.00          | 5910.00                  | 1000.00                 | 31.80    | 0.008700                            | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 50                       | 714.00                     | 4.80                      | 72.00         | 2.26                 | -0.00          | 29.00         | 1.00            | 30.00           | -0.00     | -0.00 | -0.00        |
| 62                       | 777.00                     | 6.50                      | 53.00         | 2.47                 | -0.00          | 45.00         | 2.00            | 47.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 844.00                     | 8.50                      | 26.00         | 2.70                 | -0.00          | 59.00         | 3.00            | 62.00           | -0.00     | -0.00 | -0.00        |
| 85                       | 939.00                     | 11.00                     | 22.00         | 3.02                 | -0.00          | 83.00         | 3.00            | 86.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 550.00                     | 0.30                      | 675.00        | 1.62                 | -0.00          | 4.00          | 5.00            | 9.00            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 50                       | 6.33                      | -0.00                     | 0.14                       | 3123.29                    | 4.19                      | 4.33                       | 32.42             | -0.00             | 0.74               | 15991.25           | 21.45             | 22.19              |
| 62                       | 4.27                      | -0.00                     | 0.26                       | 3126.53                    | 5.95                      | 6.22                       | 26.98             | -0.00             | 1.67               | 19759.68           | 37.63             | 39.31              |
| 73                       | 1.92                      | -0.00                     | 0.36                       | 3130.23                    | 7.15                      | 7.51                       | 14.60             | -0.00             | 2.77               | 23821.02           | 54.42             | 57.18              |
| 85                       | 1.45                      | -0.00                     | 0.33                       | 3130.96                    | 9.00                      | 9.32                       | 13.59             | -0.00             | 3.04               | 29305.79           | 84.20             | 87.24              |
| 5                        | 79.77                     | -0.00                     | 0.97                       | 3007.91                    | 0.78                      | 1.75                       | 79.77             | -0.00             | 0.97               | 3007.91            | 0.78              | 1.75               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 50                       | 3.603          | 1776.805         | -0.000          | 2.383          | 0.082            | 2.466            |
| 62                       | 2.399          | 1756.416         | -0.000          | 3.345          | 0.149            | 3.494            |
| 73                       | 1.102          | 1797.813         | -0.000          | 4.107          | 0.209            | 4.316            |
| 85                       | 0.879          | 1895.588         | -0.000          | 5.446          | 0.197            | 5.643            |
| 5                        | 81.394         | 3069.298         | -0.000          | 0.792          | 0.990            | 1.783            |

DATE: 7/29/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 338 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: 645643

RATED THRUST: 18000.

ENGINE TOTAL TIME: 11171. HRS

TIME SINCE HOT SECTION OVERHAUL: 161. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11171. HRS  
 N2 COMPRESSOR OVERHAUL: 5192. HRS  
 COMBUSTOR CAN REPLACEMENT: -0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 5192. HRS  
 N1 TURBINE OVERHAUL: 13176. HRS  
 N2 TURBINE OVERHAUL: 11176. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 67.00 FINISH 68.00

ATMOSPHERIC PRESSURE: START 29.11 FINISH 29.11

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0120

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 137.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 7

COMMENTS:

H/C CAL ESTIMATED  
 SAMPLE LINE TEMP. AVERAGED  
 PROBE LOCATED 30" FROM TAILPIPE  
 LOST SAMPLE FLOW ON LAST RUN

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HK | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 910.00     | 4/ 0      | 710.00                   | 3                  | 1840.00          | 5560.00                  | 1060.00                 | -0.00    | -0.000000                           | -0.00                     | 1.02                         |
| 1015.00    | 4/ 4      | 850.00                   | 4                  | 1930.00          | 5555.00                  | 1060.00                 | -0.00    | -0.000000                           | -0.00                     | 1.02                         |
| 1020.00    | 5/ 4      | 11310.00                 | 62                 | 5760.00          | 9280.00                  | 6048.00                 | 160.00   | -0.000000                           | -0.00                     | 1.50                         |
| 1030.00    | 4/ 5      | 950.00                   | 5                  | 1960.00          | 5650.00                  | 960.00                  | -0.00    | -0.000000                           | -0.00                     | 1.02                         |
| 1045.00    | 1/ 4      | 10900.00                 | 60                 | 5700.00          | 9250.00                  | 5770.00                 | 154.00   | -0.000000                           | -0.00                     | 1.47                         |
| 1050.00    | 2/ 1      | 13410.00                 | 74                 | 6150.00          | 9560.00                  | 7210.00                 | 175.00   | -0.000000                           | -0.00                     | 1.62                         |
| 1055.00    | 3/ 2      | 16000.00                 | 88                 | 6670.00          | 9920.00                  | 9100.00                 | 197.00   | -0.000000                           | -0.00                     | 1.87                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 3                        | 565.00                     | 14.66                     | 855.00        | 1.43                 | 2117.00        | 1.90          | 4.00            | 5.90            | -0.00     | -0.00 | -0.00        |
| 4                        | 565.00                     | 14.66                     | 815.00        | 1.35                 | 2030.00        | 1.60          | 5.00            | 6.60            | -0.00     | -0.00 | -0.00        |
| 62                       | 790.00                     | 20.79                     | 21.50         | 2.31                 | 2.80           | 50.20         | 10.00           | 60.20           | 0.56      | -0.00 | -0.00        |
| 5                        | 550.00                     | 14.66                     | 735.00        | 1.32                 | 1469.00        | 1.40          | 6.00            | 7.40            | 37.20     | -0.00 | -0.00        |
| 60                       | 775.00                     | 20.49                     | 33.30         | 2.31                 | 3.00           | 48.30         | 10.00           | 58.30           | 0.47      | -0.00 | -0.00        |
| 74                       | 845.00                     | 22.60                     | 22.00         | 2.55                 | 2.20           | 68.50         | 11.00           | 79.50           | 0.28      | -0.00 | -0.00        |
| 88                       | 940.00                     | 25.60                     | 16.50         | 2.83                 | -0.00          | -0.00         | -0.00           | -0.00           | 0.15      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 3                        | 99.43                     | 141.00                    | 0.76                       | 2612.85                    | 0.36                      | 1.13                       | 105.39            | 149.46            | 0.81               | 2769.62            | 0.38              | 1.19               |
| 4                        | 100.15                    | 142.87                    | 1.01                       | 2606.58                    | 0.32                      | 1.33                       | 106.16            | 151.44            | 1.07               | 2762.97            | 0.34              | 1.41               |
| 62                       | 1.87                      | 0.14                      | 1.43                       | 3152.57                    | 7.16                      | 8.59                       | 11.29             | 0.84              | 8.63               | 19066.75           | 43.32             | 51.94              |
| 5                        | 95.84                     | 109.70                    | 1.29                       | 2704.35                    | 0.30                      | 1.58                       | 92.00             | 105.31            | 1.23               | 2546.17            | 0.29              | 1.52               |
| 60                       | 2.89                      | 0.15                      | 1.43                       | 3150.94                    | 6.89                      | 8.31                       | 16.68             | 0.86              | 8.23               | 18180.91           | 39.74             | 47.97              |
| 74                       | 1.73                      | 0.10                      | 1.42                       | 3152.90                    | 8.85                      | 10.28                      | 12.48             | 0.71              | 10.25              | 22732.40           | 63.84             | 74.09              |
| 88                       | 1.17                      | -0.00                     | -0.00                      | 3154.05                    | -0.00                     | -0.00                      | 10.65             | -0.00             | -0.00              | 28701.85           | -0.00             | -0.00              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 3                        | 148.441        | 3900.880         | 210.501         | 0.542          | 1.141            | 1.643            |
| 4                        | 124.895        | 3250.557         | 178.167         | 0.403          | 1.259            | 1.661            |
| 62                       | 0.999          | 1685.832         | 0.074           | 3.830          | 0.763            | 4.593            |
| 5                        | 96.847         | 2732.814         | 110.857         | 0.303          | 1.299            | 1.602            |
| 60                       | 1.530          | 1667.973         | 0.079           | 3.646          | 0.755            | 4.401            |
| 74                       | 0.931          | 1695.183         | 0.053           | 4.760          | 0.764            | 5.525            |
| 88                       | 0.666          | 1793.865         | -0.000          | -0.000         | -0.000           | -0.000           |

DATE: 7/29/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL TO NUMBER: 342 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: 667944

RATED THRUST: 18000.

ENGINE TOTAL TIME: 9380. HRS

TIME SINCE HOT SECTION OVERHAUL: 2931. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9380. HRS

N2 COMPRESSOR OVERHAUL: 9380. HRS

COMBUSTOR CAN REPLACEMENT: -0. HRS

FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 2931. HRS

N1 TURBINE OVERHAUL: 9380. HRS

N2 TURBINE OVERHAUL: 9380. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 74.00

ATMOSPHERIC PRESSURE: START 29.30 FINISH 29.30

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0140

RELATIVE HUMIDITY: 78.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 137.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 1

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
DATA FOR UNTRIMMED IDLE ONLY.  
ENGINE SHUTDOWN & REMOVED FROM TEST CELL DUE TO OIL LEAK.  
PROBE 10" DOWNSTREAM

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATIO T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 115.00     | 4/ 0      | 600.00                   | 3                  | 1720.00          | 5140.00                  | 1000.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO <sub>2</sub> (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO <sub>2</sub> (WET) PPMV | NO <sub>x</sub> (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|---------------------------------|----------------|---------------|----------------------------|----------------------------|-----------|-------|--------------|
| 3                        | 587.00                     | 14.63                     | 1090.00       | 0.98                            | 2959.00        | 1.90          | 4.00                       | 5.90                       | 56.70     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO <sub>2</sub> LB/1K LB FUEL | MASS EMI CO <sub>2</sub> LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NO <sub>x</sub> LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO <sub>2</sub> LB/HR | MASS EMI CO <sub>2</sub> LB/HR | MASS EMI NO LB/HR | MASS EMI NO <sub>x</sub> LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------------------|----------------------------------------|---------------------------|----------------------------------------|-------------------|-------------------|--------------------------------|--------------------------------|-------------------|--------------------------------|
| 3                        | 158.09                    | 245.79                    | 0.95                                   | 2233.21                                | 0.45                      | 1.41                                   | 158.09            | 245.79            | 0.95                           | 2233.21                        | 0.45              | 1.41                           |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO <sub>2</sub> LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO <sub>2</sub> LB/1K#TH-HR | NO <sub>x</sub> LB/1K#TH-HR |
|--------------------------|----------------|-----------------------------|-----------------|----------------|-----------------------------|-----------------------------|
| 3                        | 263.476        | 3722.017                    | 409.642         | 0.754          | 1.588                       | 2.343                       |

DATE: 8/18/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 356 ENGINE TYPE AND MODEL: JT3D -3B SERIAL NUMBER: P-668821

RATED THRUST: 18000.

ENGINE TOTAL TIME: -0. HRS

TIME SINCE HOT SECTION OVERHAUL: -0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.66 FINISH 29.05

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0115

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00

SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |       |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|-------|
| 1751.00    | 1/ 0      | 5000.00            | 27                       | 4210.00          | 8315.00                  | 2791.00                 | 89.11    | 0.008700                            | -0.00                     | 1.10                         | -0.00 |
| 1843.00    | 3/ 1      | 8850.00            | 49                       | 5240.00          | 9015.00                  | 4634.00                 | 125.14   | 0.010290                            | -0.00                     | 1.34                         | -0.00 |
| 1850.00    | 4/ 3      | 10700.00           | 59                       | 5610.00          | 9240.00                  | 5559.00                 | 141.44   | 0.010900                            | -0.00                     | 1.44                         | -0.00 |
| 1908.00    | 5/ 4      | 12600.00           | 69                       | 5950.00          | 9460.00                  | 6667.00                 | 156.93   | 0.011800                            | -0.00                     | 1.55                         | -0.00 |
| 1918.00    | 6/ 5      | 14500.00           | 80                       | 6280.00          | 9680.00                  | 7845.00                 | 170.22   | 0.012800                            | -0.00                     | 1.68                         | -0.00 |
| 1923.00    | 7/ 6      | 16400.00           | 91                       | 6690.00          | 9975.00                  | 9408.00                 | 183.99   | 0.014200                            | -0.00                     | 1.84                         | -0.00 |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 27                       | 640.00                     | 16.91                     | 110.60        | 1.72                 | 8.00           | 22.60         | 3.00            | 25.60           | -0.00     | -0.00 | -0.00        |
| 49                       | 725.00                     | 19.36                     | 48.50         | 2.60                 | 8.00           | 40.90         | 7.80            | 48.70           | -0.00     | -0.00 | -0.00        |
| 59                       | 760.00                     | 20.72                     | 32.40         | 2.23                 | 8.00           | 52.30         | 6.90            | 59.20           | -0.00     | -0.00 | -0.00        |
| 69                       | 810.00                     | 22.29                     | 21.60         | 2.51                 | 8.00           | 66.40         | 4.80            | 71.20           | -0.00     | -0.00 | -0.00        |
| 80                       | 870.00                     | 24.00                     | 15.60         | 2.79                 | 8.00           | 88.20         | 6.40            | 94.60           | -0.00     | -0.00 | -0.00        |
| 91                       | 965.00                     | 26.24                     | 11.70         | 3.12                 | 8.00           | 121.60        | 4.70            | 126.30          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 27                       | 12.75                     | 0.53                      | 0.57                       | 3116.26                    | 4.28                      | 4.85                       | 35.59             | 1.47              | 1.59               | 8697.47            | 11.95             | 13.53              |
| 49                       | 3.72                      | 0.35                      | 0.98                       | 3130.94                    | 5.15                      | 6.13                       | 17.23             | 1.63              | 4.55               | 14509.78           | 23.86             | 28.41              |
| 59                       | 2.90                      | 0.41                      | 1.01                       | 3132.07                    | 7.68                      | 8.69                       | 16.10             | 2.28              | 5.63               | 17411.18           | 42.69             | 48.32              |
| 69                       | 1.72                      | 0.36                      | 0.63                       | 3134.05                    | 8.67                      | 9.29                       | 11.44             | 2.43              | 4.18               | 20894.70           | 57.78             | 61.96              |
| 80                       | 1.12                      | 0.33                      | 0.75                       | 3135.09                    | 10.36                     | 11.11                      | 8.75              | 2.57              | 5.90               | 24594.80           | 81.28             | 87.18              |
| 91                       | 0.75                      | 0.29                      | 0.49                       | 3135.77                    | 12.78                     | 13.27                      | 7.04              | 2.76              | 4.65               | 29501.28           | 120.20            | 124.85             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 27                       | 7.119          | 1739.495         | 0.295           | 2.389          | 0.317            | 2.707            |
| 49                       | 1.946          | 1639.410         | 0.184           | 2.696          | 0.514            | 3.210            |
| 59                       | 1.505          | 1627.213         | 0.213           | 3.990          | 0.526            | 4.516            |
| 69                       | 0.908          | 1658.310         | 0.193           | 4.586          | 0.332            | 4.918            |
| 80                       | 0.604          | 1696.193         | 0.177           | 5.606          | 0.407            | 6.012            |
| 91                       | 0.429          | 1798.859         | 0.168           | 7.329          | 0.283            | 7.613            |

DATE: 7/20/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 410 ENGINE TYPE AND MODEL: JT3D-7 SERIAL NUMBER: 671088  
RATED THRUST: 19000.

ENGINE TOTAL TIME: 6266. HRS

TIME SINCE HOT SECTION OVERHAUL: 6266. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 57.74 FINISH 57.20

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.81

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0090

RELATIVE HUMIDITY: 88.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 3

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
PROBE LOCATED 15.25 IN. FROM TAILPIPE.  
PRE-REPAIR ENGINE.

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 2144.00    | 1/ 0      | 9432.00                  | 49                 | 5091.00          | 5079.00                  | -0.00                   | -0.000000 | -0.00                               | 1.36                      | -0.00                        |
| 2151.00    | 2/ 1      | 13889.00                 | 73                 | 5787.00          | 7474.00                  | -0.00                   | -0.000000 | -0.00                               | 1.60                      | -0.00                        |
| 2154.00    | 3/ 2      | 17441.00                 | 91                 | 6287.00          | 9719.00                  | -0.00                   | -0.000000 | -0.00                               | 1.93                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 49                       | 728.60                     | 40.30                     | 100.00        | 2.00                 | 69.00          | 36.00         | -0.00           | 40.00           | -0.00     | -0.00 | -0.00        |
| 73                       | 831.20                     | 47.10                     | 70.00         | 2.80                 | 27.00          | 72.00         | -0.00           | 76.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 923.00                     | 53.90                     | 60.00         | 3.20                 | 21.00          | 106.00        | -0.00           | 112.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 49                       | 9.96                      | 3.94                      | -0.00                      | 3129.44                    | 5.89                      | 6.54                       | 50.58             | 19.99             | -0.00              | 15894.15           | 24.91             | 33.23              |
| 73                       | 5.00                      | 1.11                      | -0.00                      | 3144.99                    | 8.45                      | 8.92                       | 37.40             | 8.26              | -0.00              | 23505.67           | 63.19             | 66.70              |
| 91                       | 3.76                      | 0.75                      | -0.00                      | 3147.92                    | 10.90                     | 11.52                      | 36.51             | 7.32              | -0.00              | 30594.64           | 105.95            | 111.94             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 49                       | 5.363          | 1685.162         | 2.119           | 3.171          | -0.000           | 3.523            |
| 73                       | 2.693          | 1692.395         | 0.595           | 4.549          | -0.000           | 4.802            |
| 91                       | 2.093          | 1754.179         | 0.420           | 6.075          | -0.000           | 6.418            |

DATE: 7/26/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 139 ENGINE TYPE AND MODEL: JT4A-9 SERIAL NUMBER: 611870  
RATED THRUST: 16800.  
ENGINE TOTAL TIME: 17581. HRS  
TIME SINCE HOT SECTION OVERHAUL: 17581. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 59.00 FINISH 57.20  
ATMOSPHERIC PRESSURE: START 29.94 FINISH 29.98  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0090  
RELATIVE HUMIDITY: 94.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00  
SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 3

COMMENTS:

EXHAUST GAS TEMPERATURE IN DEGREES C  
EXHAUST GAS PRESSURE IN INCHES HG.  
EXTERNAL OIL LEAK  
JT3C-7 PROBE USED

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |         | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|---------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2      |                                   |                               |             |                                              |                                    |                                       |
| 2156.00       | 1/ 0         | 10855.00                          | 64                       | 5605.00                | *****   | 8450.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.06                               | -0.00                                 |
| 2158.00       | 2/ 1         | 11872.00                          | 70                       | 5754.00                | 8308.00 | 9292.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.17                               | -0.00                                 |
| 2201.00       | 3/ 2         | 14938.00                          | 88                       | 6252.00                | 8656.00 | 12206.00                          | -0.00                         | -0.000000   | -0.00                                        | 2.49                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WFT)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WFT)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 64                                | 438.00                              | 61.60                              | 60.00               | 2.90                          | 2.55                 | 91.00               | -0.00                    | 96.00                    | -0.00     | -0.00 | -0.00        |
| 70                                | 462.00                              | 64.80                              | 60.00               | 2.43                          | 2.10                 | 62.00               | -0.00                    | 69.00                    | -0.00     | -0.00 | -0.00        |
| 88                                | 547.00                              | 74.50                              | 70.00               | 2.35                          | 2.25                 | 57.00               | -0.00                    | 60.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 64                                | 4.15                               | 0.10                               | -0.00                               | 3149.10                             | 10.33                              | 10.90                               | 35.04                   | 0.85                    | -0.00                    | 26609.87                 | 87.29                   | 92.09                    |
| 70                                | 4.95                               | 0.10                               | -0.00                               | 3147.84                             | 8.40                               | 9.34                                | 45.97                   | 0.92                    | -0.00                    | 29249.77                 | 78.02                   | 86.83                    |
| 88                                | 5.96                               | 0.11                               | -0.00                               | 3146.22                             | 7.98                               | 8.40                                | 72.80                   | 1.34                    | -0.00                    | 38402.72                 | 97.38                   | 102.50                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 64                                | 3.228             | 2451.393               | 0.079              | 8.042             | -0.000                 | 8.483                  |
| 70                                | 3.872             | 2463.761               | 0.078              | 6.572             | -0.000                 | 7.313                  |
| 88                                | 4.874             | 2570.808               | 0.090              | 6.519             | -0.000                 | 6.862                  |

DATE: 7/27/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 140 ENGINE TYPE AND MODEL: JT4A-9 SERIAL NUMBER: 610155  
RATED THRUST: 16800.  
ENGINE TOTAL TIME: 16751. HRS  
TIME SINCE HOT SECTION OVERHAUL: 16751. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS  
FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 57.20 FINISH 55.40  
ATMOSPHERIC PRESSURE: START 29.97 FINISH 29.96  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0083  
RELATIVE HUMIDITY: 80.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00  
SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 3

COMMENTS:

EXHAUST GAS TEMPERATURE IN DEGREES C  
EXHAUST GAS PRESSURE IN INCHES HG  
JT3C-7 PROBE USED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1216.00    | 1/ 0      | 10842.00                 | 64                 | 5574.00          | 8308.00                  | 8617.00                 | -0.00    | -0.000000                           | -0.00                     | 2.05                         |
| 1222.00    | 2/ 1      | 11885.00                 | 70                 | 5728.00          | 8423.00                  | 9518.00                 | -0.00    | -0.000000                           | -0.00                     | 2.16                         |
| 1228.00    | 3/ 2      | 14757.00                 | 87                 | 6195.00          | 8763.00                  | 12267.00                | -0.00    | -0.000000                           | -0.00                     | 2.47                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 64                       | 440.00                     | 61.30                     | 45.00         | 2.30                 | 1.80           | 61.00         | -0.00           | 64.00           | -0.00     | -0.00 | -0.00        |
| 70                       | 463.00                     | 64.70                     | 55.00         | 2.45                 | 1.50           | 68.00         | -0.00           | 72.00           | -0.00     | -0.00 | -0.00        |
| 87                       | 546.00                     | 73.70                     | 55.00         | 2.75                 | 1.50           | 94.40         | -0.00           | 102.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 64                       | 3.92                      | 0.09                      | -0.00                      | 3149.48                    | 8.73                      | 9.16                       | 33.79             | 0.77              | -0.00              | 27139.09           | 75.25             | 78.95              |
| 70                       | 4.50                      | 0.07                      | -0.00                      | 3148.63                    | 9.14                      | 9.67                       | 42.82             | 0.67              | -0.00              | 29968.63           | 86.95             | 92.07              |
| 87                       | 4.01                      | 0.06                      | -0.00                      | 3149.42                    | 11.30                     | 12.21                      | 49.18             | 0.77              | -0.00              | 38633.90           | 138.64            | 149.80             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 64                       | 3.117          | 2503.144         | 0.071           | 6.940          | -0.000           | 7.231            |
| 70                       | 3.603          | 2521.551         | 0.056           | 7.316          | -0.000           | 7.747            |
| 87                       | 3.332          | 2618.005         | 0.052           | 9.395          | -0.000           | 10.151           |

DATE: 8/ 3/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 343 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 653435  
RATED THRUST: 14000.

ENGINE TOTAL TIME: 11614. HRS

TIME SINCE HOT SECTION OVERHAUL: 7277. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 11614. HRS  
N2 COMPRESSOR OVERHAUL: 11614. HRS  
COMBUSTOR CAN REPLACEMENT: 7277. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 2768. HRS  
N1 TURBINE OVERHAUL: 2768. HRS  
N2 TURBINE OVERHAUL: 11614. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 75.00 FINISH 76.00

ATMOSPHERIC PRESSURE: START 29.08 FINISH 29.08

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0140

RELATIVE HUMIDITY: 76.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 133.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
WITHOUT RETROFIT

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |          | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2       |                                   |                               |             |                                              |                                    |                                       |
| 1030.00       | 2/ 0         | 9550.00                           | 68                       | 7300.00                | 11030.00 | 5630.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.63                               | -0.00                                 |
| 1035.00       | 1/ 2         | 950.00                            | 6                        | 2900.00                | 7180.00  | 1030.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.11                               | -0.00                                 |
| 1045.00       | 5/ 1         | 12700.00                          | 90                       | 8060.00                | 11530.00 | 7810.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.93                               | -0.00                                 |
| 1055.00       | 1/ 5         | 910.00                            | 6                        | 2850.00                | 707.00   | 1060.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.11                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 68                                | 870.00                              | 23.19                              | 34.20               | 1.80                          | 2.60                 | 30.00               | 49.00                    | 79.00                    | -0.00     | -0.00 | -0.00        |
| 6                                 | 695.00                              | 15.95                              | 105.00              | 0.46                          | 36.70                | 2.10                | 5.00                     | 7.10                     | -0.00     | -0.00 | -0.00        |
| 90                                | 1000.00                             | 27.28                              | 33.00               | 2.37                          | 2.80                 | 61.20               | 68.00                    | 129.20                   | -0.00     | -0.00 | -0.00        |
| 6                                 | 695.00                              | 15.95                              | 73.00               | 0.34                          | 45.90                | 1.60                | 6.00                     | 7.60                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 68                                | 3.81                               | 0.17                               | 8.96                                | 3149.45                             | 5.49                               | 14.45                               | 21.44                   | 0.93                    | 50.46                    | 17731.40                 | 30.89                   | 81.35                    |
| 6                                 | 44.48                              | 8.90                               | 3.48                                | 3061.58                             | 1.46                               | 4.94                                | 45.81                   | 9.17                    | 3.58                     | 3153.42                  | 1.50                    | 5.09                     |
| 90                                | 2.79                               | 0.14                               | 9.45                                | 3151.13                             | 8.51                               | 17.96                               | 21.81                   | 1.06                    | 73.82                    | 24610.31                 | 66.44                   | 140.25                   |
| 6                                 | 41.67                              | 15.00                              | 5.63                                | 3049.26                             | 1.50                               | 7.13                                | 44.17                   | 15.91                   | 5.96                     | 3232.21                  | 1.59                    | 7.55                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 68                                | 2.245             | 1856.691               | 0.098              | 3.235             | 5.284                  | 8.514                  |
| 6                                 | 48.223            | 3319.394               | 9.653              | 1.584             | 3.772                  | 5.356                  |
| 90                                | 1.717             | 1937.820               | 0.083              | 5.231             | 5.812                  | 11.044                 |
| 6                                 | 48.536            | 3551.878               | 17.478             | 1.747             | 6.553                  | 8.300                  |

DATE: 7/ 1/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 126 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 654607  
RATED THRUST: 14000.

ENGINE TOTAL TIME: 9392. HRS

TIME SINCE HOT SECTION OVERHAUL: 2876. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7351. HRS  
N2 COMPRESSOR OVERHAUL: 7304. HRS  
COMBUSTOR CAN REPLACEMENT: 2472. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 1231. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 56.84 FINISH 56.30

ATMOSPHERIC PRESSURE: START 29.91 FINISH 29.90

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0069

RELATIVE HUMIDITY: 69.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 1.50

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 3

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.

| CLOCK<br>TIME | TEST<br>MODE | POWER                    |                          | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |       |
|---------------|--------------|--------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|-------|
|               |              | THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. |                        |                                   |                               |             |                                              |                                    |                                       |       |
| 2031.00       | 1/ 0         | 10774.00                 | 76                       | 7427.00                | 11025.00                          | 6246.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.72                                  | -0.00 |
| 2037.00       | 2/ 1         | 12222.00                 | 87                       | 7797.00                | 11265.00                          | 7175.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.84                                  | -0.00 |
| 2041.00       | 3/ 2         | 13521.00                 | 96                       | 8139.00                | 11502.00                          | 8140.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.96                                  | -0.00 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 76                                | 867.20                              | 51.60                              | 35.00               | 2.28                          | 1.80                 | 86.00               | -0.00                    | 88.00                    | -0.00     | -0.00 | -0.00        |
| 87                                | 912.20                              | 55.10                              | 20.00               | 2.48                          | 1.80                 | 111.00              | -0.00                    | 113.00                   | -0.00     | -0.00 | -0.00        |
| 96                                | 962.60                              | 58.60                              | 20.00               | 2.62                          | 1.80                 | 134.00              | -0.00                    | 137.00                   | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 76                                | 3.08                               | 0.09                               | -0.00                               | 3150.80                             | 12.42                              | 12.71                               | 19.23                   | 0.57                    | -0.00                    | 19679.92                 | 77.60                   | 79.41                    |
| 87                                | 1.62                               | 0.08                               | -0.00                               | 3153.12                             | 14.75                              | 15.02                               | 11.61                   | 0.60                    | -0.00                    | 22623.63                 | 105.86                  | 107.76                   |
| 96                                | 1.93                               | 0.08                               | -0.00                               | 3153.27                             | 16.86                              | 17.24                               | 12.47                   | 0.64                    | -0.00                    | 25667.57                 | 137.24                  | 140.31                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 76                                | 1.785             | 1826.612               | 0.053              | 7.203             | -0.000                 | 7.370                  |
| 87                                | 0.950             | 1851.058               | 0.049              | 8.661             | -0.000                 | 8.817                  |
| 96                                | 0.922             | 1898.349               | 0.048              | 10.150            | -0.000                 | 10.377                 |

DATE: 7/ 8/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 131 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 655821

RATED THRUST: 14000.

ENGINE TOTAL TIME: 4929. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 9008. HRS  
N2 COMPRESSOR OVERHAUL: 3404. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 54.86 FINISH 54.68

ATMOSPHERIC PRESSURE: START 30.01 FINISH 29.99

INLET AIR HUMIDITY, LBS H2O/LB AIR: -0.0000

RELATIVE HUMIDITY: -0.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: -0.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 3

COMMENTS:

EXHAUST GAS PRESSURE IS IN INCHES HG.

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 608.00     | 1/ 0      | 10817.00                 | 77                 | 7366.00          | 11053.00                 | 6251.00                 | -0.00    | -0.000000                           | -0.00                     | 1.73                         |
| 613.00     | 2/ 1      | 12172.00                 | 86                 | 7663.00          | 11288.00                 | 7111.00                 | -0.00    | -0.000000                           | -0.00                     | 1.84                         |
| 616.00     | 3/ 2      | 13539.00                 | 96                 | 7981.00          | 11520.00                 | 8054.00                 | -0.00    | -0.000000                           | -0.00                     | 1.96                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 77                       | 860.00                     | 51.90                     | 10.00         | 1.97                 | 1.95           | 81.00         | -0.00           | 86.00           | -0.00     | -0.00 | -0.00        |
| 86                       | 905.00                     | 55.20                     | 10.00         | 2.22                 | 2.10           | 104.00        | -0.00           | 109.00          | -0.00     | -0.00 | -0.00        |
| 96                       | 957.20                     | 58.70                     | 10.00         | 2.43                 | 2.10           | 129.00        | -0.00           | 134.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 77                       | 1.02                      | 0.11                      | -0.00                      | 3153.98                    | 13.56                     | 14.39                      | 6.37              | 0.71              | -0.00              | 19715.51           | 84.74             | 89.98              |
| 86                       | 0.90                      | 0.11                      | -0.00                      | 3154.17                    | 15.45                     | 16.19                      | 6.43              | 0.77              | -0.00              | 22429.30           | 109.84            | 115.13             |
| 96                       | 0.83                      | 0.10                      | -0.00                      | 3154.32                    | 17.51                     | 18.18                      | 6.65              | 0.80              | -0.00              | 25404.87           | 140.99            | 146.45             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 77                       | 0.589          | 1822.641         | 0.066           | 7.834          | -0.000           | 8.318            |
| 86                       | 0.528          | 1842.697         | 0.064           | 9.024          | -0.000           | 9.458            |
| 96                       | 0.491          | 1876.421         | 0.059           | 10.413         | -0.000           | 10.817           |

DATE: 7/21/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 406 ENGINE TYPE AND MODEL: JT8D-7 SERIAL NUMBER: 655998

RATED THRUST: 14000.

ENGINE TOTAL TIME: 4005. HRS

TIME SINCE HOT SECTION OVERHAUL: 4005. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 10914. HRS  
N2 COMPRESSOR OVERHAUL: 15004. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 68.00 FINISH 68.00

ATMOSPHERIC PRESSURE: START 29.88 FINISH 29.96

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0100

RELATIVE HUMIDITY: 63.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 1

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG.  
ENGINE HAD OIL LEAD INTO CELL

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |       |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|-------|
|               |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |       |
| 1500.00       | 1/ 0         | 11023.00                          | 78                       | 7493.00                | 11088.00                          | 6431.00                       | -0.00       | -0.000000                                    | -0.00                              | 1.75                                  | -0.00 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 78                                | 917.60                              | 52.20                              | 40.00               | 2.15                          | 1.50                 | 90.00               | -0.00                    | 98.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 78                                | 3.73                               | 0.08                               | -0.00                               | 3149.81                             | 13.78                              | 15.01                               | 23.99                   | 0.52                    | -0.00                    | 20256.42                 | 88.64                   | 96.52                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 78                                | 2.176             | 1837.650               | 0.047              | 8.042             | -0.000                 | 8.757                  |

DATE: 7/16/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 91 ENGINE TYPE AND MODEL: JT8D-1 SERIAL NUMBER: 649416  
RATED THRUST: 14000.

ENGINE TOTAL TIME: 2160. HRS

TIME SINCE MDT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 14.35 FINISH 14.35

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0105

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 135.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C IS CAL-ESTIMATED  
NEW PROBE CONFIG. USED  
SAMPLE LINE TEMP. AVERAGED  
NEW PROBE CONFIGURATION USED FOR THIS RUN  
WITH RETROFIT

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1255.00    | 5/ 0      | 9400.00                  | 67                 | 7215.00          | 10980.00                 | 5540.00                 | -0.00    | -0.000000                           | -0.00                     | 14.15                        |
| 100.00     | 1/ 5      | 990.00                   | 7                  | 2910.00          | 7200.00                  | 1063.00                 | -0.00    | -0.000000                           | -0.00                     | 14.13                        |
| 120.00     | 1/ 1      | 970.00                   | 6                  | 2880.00          | 7130.00                  | 1088.00                 | -0.00    | -0.000000                           | -0.00                     | 14.33                        |
| 125.00     | 4/ 1      | 10800.00                 | 77                 | 7510.00          | 11200.00                 | 6450.00                 | -0.00    | -0.000000                           | -0.00                     | 14.15                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 67                       | 900.00                     | 32.10                     | 19.50         | 2.23                 | 1.90           | 69.80         | 9.00            | 78.80           | 0.36      | -0.00 | -0.00        |
| 7                        | 715.00                     | 14.75                     | 169.00        | 1.17                 | 64.80          | 5.50          | 7.00            | 12.50           | 6.36      | -0.00 | -0.00        |
| 6                        | 715.00                     | 14.75                     | 162.00        | 1.15                 | 62.60          | 4.10          | 6.00            | 10.10           | -0.00     | -0.00 | -0.00        |
| 77                       | 945.00                     | 24.65                     | 19.50         | 2.41                 | 3.00           | 43.70         | 8.50            | 52.20           | 0.29      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 67                       | 1.75                      | 0.10                      | 1.33                       | 3152.86                    | 10.32                     | 11.65                      | 9.72              | 0.54              | 7.37               | 17466.87           | 57.15             | 64.52              |
| 7                        | 28.44                     | 6.25                      | 1.94                       | 3094.07                    | 1.52                      | 3.46                       | 30.24             | 6.64              | 2.06               | 3288.99            | 1.62              | 3.67               |
| 6                        | 27.75                     | 6.14                      | 1.69                       | 3095.44                    | 1.15                      | 2.84                       | 30.19             | 6.68              | 1.84               | 3367.83            | 1.26              | 3.09               |
| 77                       | 1.62                      | 0.14                      | 1.16                       | 3152.95                    | 5.98                      | 7.14                       | 10.47             | 0.92              | 7.50               | 20336.50           | 38.55             | 46.05              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 67                       | 1.034          | 1858.177         | 0.058           | 6.080          | 0.784            | 6.864            |
| 7                        | 30.541         | 3322.215         | 6.707           | 1.633          | 2.078            | 3.711            |
| 6                        | 31.128         | 3471.994         | 6.889           | 1.294          | 1.894            | 3.188            |
| 77                       | 0.970          | 1883.010         | 0.085           | 3.569          | 0.694            | 4.264            |

DATE: 6/25/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 88 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: 665281  
RATED THRUST: 14500.  
ENGINE TOTAL TIME: 6589. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 90.00 FINISH 91.00  
ATMOSPHERIC PRESSURE: START 14.35 FINISH 14.35  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0130  
RELATIVE HUMIDITY: 42.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 109.00, FLOW RATE, LITERS/MIN: 16.00  
SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 5

COMMENTS:

H/C IS CAL-ESTIMATED  
TEMPERATURE OF SAMPLE LINE AVERAGED  
WITH RETROFIT

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| 1130.00    | 1/ 0      | 920.00             | 6                        | 2890.00 7210.00        | 1110.00                  | -0.00                   | -0.000000 | -0.00                               | 1.05                      | 14.38                        |
| 1135.00    | 2/ 1      | 13360.00           | 92                       | 8120.00 11590.00       | 8300.00                  | -0.00                   | -0.000000 | -0.00                               | 1.98                      | 14.20                        |
| 1140.00    | 3/ 2      | 11640.00           | 80                       | 7723.00 11384.00       | 7040.00                  | -0.00                   | -0.000000 | -0.00                               | 1.84                      | 14.20                        |
| 1145.00    | 4/ 3      | 10600.00           | 73                       | 7487.00 11217.00       | 6340.00                  | -0.00                   | -0.000000 | -0.00                               | 1.80                      | 14.20                        |
| 1150.00    | 5/ 4      | 10070.00           | 69                       | 7377.00 11131.00       | 5990.00                  | -0.00                   | -0.000000 | -0.00                               | 1.63                      | 14.20                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 6                        | -0.00                      | 15.20                     | 66.00         | 0.56                 | -0.00          | 5.50          | 1.50            | 7.00            | 2.76      | -0.00 | -0.00        |
| 92                       | 1040.00                    | 28.30                     | 20.00         | 3.07                 | -0.00          | 167.00        | 7.50            | 174.50          | 0.90      | -0.00 | -0.00        |
| 80                       | 975.00                     | 26.30                     | 24.00         | 2.82                 | -0.00          | 138.00        | 8.50            | 146.50          | 1.22      | -0.00 | -0.00        |
| 73                       | 935.00                     | 25.90                     | 27.00         | 2.48                 | -0.00          | 118.00        | 9.00            | 127.00          | 1.59      | -0.00 | -0.00        |
| 69                       | 925.00                     | 23.30                     | 28.00         | 2.45                 | -0.00          | 112.00        | 9.00            | 121.00          | 0.87      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 6                        | 23.40                     | -0.00                     | 0.87                       | 3119.13                    | 3.20                      | 4.08                       | 25.67             | -0.00             | 0.97               | 3467.23            | 3.55              | 4.52               |
| 92                       | 1.31                      | -0.00                     | 0.81                       | 3153.83                    | 17.93                     | 18.74                      | 10.85             | -0.00             | 6.69               | 26176.82           | 148.86            | 155.54             |
| 80                       | 1.71                      | -0.00                     | 0.99                       | 3153.20                    | 16.13                     | 17.12                      | 12.02             | -0.00             | 6.99               | 22198.56           | 113.56            | 120.56             |
| 73                       | 2.18                      | -0.00                     | 1.20                       | 3152.46                    | 15.68                     | 16.88                      | 13.85             | -0.00             | 7.58               | 19986.57           | 99.41             | 107.00             |
| 69                       | 2.29                      | -0.00                     | 1.21                       | 3152.29                    | 15.06                     | 16.28                      | 13.73             | -0.00             | 7.25               | 18882.19           | 90.24             | 97.49              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 6                        | 28.228         | 3763.293         | -0.000          | 3.864          | 1.054            | 4.918            |
| 92                       | 0.812          | 1959.343         | -0.000          | 11.142         | 0.500            | 11.643           |
| 80                       | 1.033          | 1907.093         | -0.000          | 9.756          | 0.601            | 10.357           |
| 73                       | 1.306          | 1885.526         | -0.000          | 9.379          | 0.715            | 10.094           |
| 69                       | 1.364          | 1875.094         | -0.000          | 8.961          | 0.720            | 9.681            |

DATE: 8/19/71

TEST ORGANIZATION: PRATT & WHITNEY

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 354 ENGINE TYPE AND MODEL: JT-8D-9 SERIAL NUMBER: P-666987  
RATED THRUST: 14500.  
ENGINE TOTAL TIME: -0. HRS  
TIME SINCE HOT SECTION OVERHAUL: -0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS  
FUEL: JP-4 FUEL H/C RATIO: 2.000

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 80.00  
ATMOSPHERIC PRESSURE: START 29.96 FINISH 29.95  
INLET AIR HUMIDITY, LBS H2O/LB AIR: -0.0000  
RELATIVE HUMIDITY: -0.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 2.00  
SAMPLE LINE TRANSPORT TIME, SEC: 1.00

NUMBER OF TESTS: 6

COMMENTS:

EXHAUST GAS PRESSURE IN INCHES HG

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM N1 | ENGINE SPEED RPM N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|---------------------|---------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 1713.00    | 1/ 0      | 5040.00                  | 34                 | 5750.00             | 9880.00             | 2929.00                  | 84.80                   | 0.009590 | -0.00                               | 1.30                      | -0.00                        |
| 1001.00    | 2/ 1      | 9520.00                  | 65                 | 7160.00             | 10910.00            | 5375.00                  | 121.00                  | 0.012340 | -0.00                               | 1.63                      | -0.00                        |
| 1811.00    | 3/ 2      | 10850.00                 | 74                 | 7460.00             | 11125.00            | 6190.00                  | 129.00                  | 0.013330 | -0.00                               | 1.75                      | -0.00                        |
| 1822.00    | 4/ 3      | 11950.00                 | 82                 | 7710.00             | 11294.00            | 6860.00                  | 136.60                  | 0.013950 | -0.00                               | 1.85                      | -0.00                        |
| 1030.00    | 5/ 4      | 13750.00                 | 94                 | 8175.00             | 11590.00            | 8195.00                  | 150.80                  | 0.015090 | -0.00                               | 2.02                      | -0.00                        |
| 1845.00    | 6/ 5      | 840.00                   | 5                  | 2590.00             | 840.00              | 911.00                   | 29.90                   | 0.008460 | -0.00                               | 1.04                      | -0.00                        |

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| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 34                       | 710.00                     | 38.61                     | 49.30         | 1.68                 | 5.90           | 0.0           | 6.50            | 6.50            | -0.00     | -0.00 | -0.00        |
| 65                       | 875.00                     | 48.26                     | 18.50         | 2.38                 | 3.30           | 85.90         | 9.10            | 95.00           | -0.00     | -0.00 | -0.00        |
| 74                       | 915.00                     | 51.63                     | 15.00         | 2.58                 | 3.20           | 105.20        | 9.10            | 1143.00         | -0.00     | -0.00 | -0.00        |
| 82                       | 950.00                     | 54.32                     | 13.20         | 2.69                 | 3.50           | 124.10        | 9.10            | 133.20          | -0.00     | -0.00 | -0.00        |
| 94                       | 1010.00                    | 59.29                     | 10.70         | 2.95                 | 4.50           | 166.00        | 9.40            | 175.40          | -0.00     | -0.00 | -0.00        |
| 5                        | 685.00                     | 31.05                     | 195.20        | 0.92                 | 31.10          | 6.80          | 2.30            | 9.10            | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 34                       | 5.84                      | 0.40                      | 1.26                       | 3127.47                    | 0.0                       | 1.26                       | 17.11             | 1.17              | 3.71               | 9160.16            | 0.0               | 3.71               |
| 65                       | 1.55                      | 0.16                      | 1.25                       | 3134.87                    | 11.83                     | 13.08                      | 8.34              | 0.85              | 6.74               | 16849.94           | 63.58             | 70.31              |
| 74                       | 1.16                      | 0.14                      | 1.16                       | 3135.53                    | 13.37                     | 145.22                     | 7.18              | 0.88              | 7.16               | 19408.95           | 82.73             | 898.90             |
| 82                       | 0.98                      | 0.15                      | 1.11                       | 3135.80                    | 15.12                     | 16.23                      | 6.72              | 1.02              | 7.61               | 21511.56           | 103.75            | 111.35             |
| 94                       | 0.72                      | 0.17                      | 1.04                       | 3136.13                    | 18.45                     | 19.49                      | 5.93              | 1.43              | 8.56               | 25700.58           | 151.19            | 159.75             |
| 5                        | 41.35                     | 3.77                      | 0.80                       | 3062.41                    | 2.37                      | 3.17                       | 37.67             | 3.44              | 0.73               | 2789.86            | 2.16              | 2.88               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 34                       | 3.395          | 1817.532         | 0.233           | 0.0            | 0.735            | 0.735            |
| 65                       | 0.876          | 1769.952         | 0.089           | 6.678          | 0.707            | 7.386            |
| 74                       | 0.662          | 1788.844         | 0.081           | 7.625          | 0.660            | 82.848           |
| 82                       | 0.562          | 1800.131         | 0.085           | 8.682          | 0.637            | 9.318            |
| 94                       | 0.431          | 1869.133         | 0.104           | 10.995         | 0.623            | 11.618           |
| 5                        | 44.849         | 3321.261         | 4.092           | 2.566          | 0.868            | 3.434            |

DATE: 8/ 6/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 333 ENGINE TYPE AND MODEL: SPEY 511-14 SERIAL NUMBER: 7065  
RATED THRUST: 11400.

ENGINE TOTAL TIME: 7861. HRS

TIME SINCE HOT SECTION OVERHAUL: 658. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 658. HRS  
N2 COMPRESSOR OVERHAUL: 658. HRS  
COMBUSTOR CAN REPLACEMENT: 658. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 658. HRS  
N1 TURBINE OVERHAUL: 658. HRS  
N2 TURBINE OVERHAUL: 658. HRS

FUEL: JET - A FUEL H/C RATIO: 1.920

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 72.00 FINISH 72.00

ATMOSPHERIC PRESSURE: START 29.12 FINISH 29.12

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0150

RELATIVE HUMIDITY: 84.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 147.00; FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 7

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
ENGINE RUN 380371, RETURNED TO SHOP FOR REPAIRS  
THEN TO TEST SECOND TIME  
PROBE SAME AS USED 08-02-71  
.FT. OF SAMPLE LINE NOT HEATED

| CLOCK TIME | TEST MOOE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 920.00     | 1/ 0      | 630.00             | 5                        | 2690.00          | 7560.00                  | 960.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 925.00     | 2/ 1      | 11340.00           | 99                       | 8500.00          | 12420.00                 | 7480.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 930.00     | 3/ 2      | 10900.00           | 95                       | 8380.00          | 12320.00                 | 7150.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 935.00     | 4/ 3      | 10300.00           | 90                       | 8190.00          | 12150.00                 | 6670.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 940.00     | 5/ 4      | 9800.00            | 85                       | 8050.00          | 12000.00                 | 6290.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 945.00     | 6/ 5      | 7500.00            | 65                       | 7375.00          | 11550.00                 | 4690.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| 950.00     | 1/ 6      | 650.00             | 5                        | 2700.00          | 7620.00                  | 93.00                   | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 810.00                     | 15.30                     | -0.00         | -0.00                | 1050.00        | -0.00         | -0.00           | -0.00           | -0.00     | -0.00 | -0.00        |
| 99                       | 1155.00                    | 35.98                     | 41.00         | 3.08                 | 5.00           | -0.00         | 18.00           | 1.25            | -0.00     | -0.00 | -0.00        |
| 95                       | 1125.00                    | 35.25                     | 43.00         | 3.00                 | 5.00           | -0.00         | 22.00           | 0.66            | -0.00     | -0.00 | -0.00        |
| 90                       | 1100.00                    | 34.03                     | 44.00         | 2.82                 | 4.00           | -0.00         | 29.00           | 0.46            | -0.00     | -0.00 | -0.00        |
| 85                       | 1075.00                    | 32.90                     | 46.00         | 2.78                 | 4.00           | -0.00         | 36.00           | 0.48            | -0.00     | -0.00 | -0.00        |
| 65                       | 955.00                     | 28.24                     | 56.00         | 2.32                 | 3.00           | -0.00         | 33.00           | 0.44            | -0.00     | -0.00 | -0.00        |
| 5                        | 820.00                     | 15.30                     | 730.00        | 1.22                 | 620.00         | -0.00         | 6.00            | 6.00            | 76.10     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | -0.00                     | 1150.35                   | -0.00                      | -0.00                      | -0.00                     | -0.00                      | -0.00             | 1104.33           | -0.00              | -0.00              | -0.00             | -0.00              |
| 99                       | 2.67                      | 0.19                      | 1.93                       | 3151.18                    | -0.00                     | 1.93                       | 19.97             | 1.39              | 14.40              | 23570.84           | -0.00             | 14.40              |
| 95                       | 2.87                      | 0.19                      | 2.42                       | 3150.85                    | -0.00                     | 2.42                       | 20.55             | 1.37              | 17.27              | 22528.56           | -0.00             | 17.27              |
| 90                       | 3.13                      | 0.16                      | 3.39                       | 3150.53                    | -0.00                     | 3.39                       | 20.87             | 1.09              | 22.59              | 21014.00           | -0.00             | 22.59              |
| 85                       | 3.32                      | 0.17                      | 4.26                       | 3150.22                    | -0.00                     | 4.26                       | 20.87             | 1.04              | 26.82              | 19814.90           | -0.00             | 26.82              |
| 65                       | 4.84                      | 0.15                      | 4.68                       | 3147.88                    | -0.00                     | 4.68                       | 22.68             | 0.70              | 21.95              | 14763.57           | -0.00             | 21.95              |
| 5                        | 108.21                    | 52.64                     | 1.46                       | 2841.47                    | -0.00                     | 1.46                       | 10.06             | 4.90              | 0.14               | 264.26             | -0.00             | 0.14               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | -0.000         | -0.005           | 1752.911        | -0.000         | -0.000           | -0.000           |
| 99                       | 1.761          | 2078.557         | 0.123           | -0.000         | 1.270            | 1.270            |
| 95                       | 1.885          | 2066.840         | 0.126           | -0.000         | 1.584            | 1.584            |
| 90                       | 2.026          | 2040.195         | 0.105           | -0.000         | 2.193            | 2.193            |
| 85                       | 2.129          | 2021.929         | 0.106           | -0.000         | 2.737            | 2.737            |
| 65                       | 3.024          | 1968.476         | 0.093           | -0.000         | 2.927            | 2.927            |
| 5                        | 15.482         | 406.548          | 7.531           | -0.000         | 0.209            | 0.209            |

DATE: 7/27/71

TEST ORGANIZATION: U.S. BUREAU OF MINES

ENGINE SUPPLIER: AMERICAN AIRLINES

ENGINE DATA .....

CAL IO NUMBER: 341 ENGINE TYPE AND MODEL: SPEY 511-14 SERIAL NUMBER: 7072  
RATED THRUST: 11400.

ENGINE TOTAL TIME: 7500. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 7500. HRS  
N2 COMPRESSOR OVERHAUL: 7500. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 7500. HRS  
N2 TURBINE OVERHAUL: 7500. HRS

FUEL: JET - A FUEL W/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 79.00

ATMOSPHERIC PRESSURE: START 29.20 FINISH 29.20

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0

RELATIVE HUMIDITY: 67.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 135.00, FLOW RATE, LITERS/MIN: 16.00

SAMPLE LINE TRANSPORT TIME, SEC: 0.99

NUMBER OF TESTS: 1

COMMENTS:

H/C CAL ESTIMATED  
SAMPLE LINE TEMP. AVERAGED  
PROBE SUPPORT PIPE FAILED AFTER RUN  
PROBE LOCATED 33" DOWNSTREAM

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 | N2      | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------------|---------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 1020.00       | 4/ 0         | 520.00                            | 4                        | 2680.00                      | 7300.00 | 1130.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALIEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 4                                 | 850.00                              | -0.00                              | 820.00              | 1.32                          | 1296.00              | 1.20                | 3.00                     | 4.20                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 4                                 | 107.54                             | 97.34                              | 0.65                                | 2719.88                             | 0.26                               | 0.90                                | 121.52                  | 109.99                  | 0.73                     | 3073.47                  | 0.29                    | 1.02                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 4                                 | 233.683           | 5910.512               | 211.526            | 0.562             | 1.404                  | 1.966                  |

DATE: 7/ 8/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 109 ENGINE TYPE AND MODEL: J52 - P8A SERIAL NUMBER: 677106

RATED THRUST: 9300.

ENGINE TOTAL TIME: 474. HRS

TIME SINCE HOT SECTION OVERHAUL: 474. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 474. HRS  
N2 COMPRESSOR OVERHAUL: 474. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 474. HRS  
N1 TURBINE OVERHAUL: 474. HRS  
N2 TURBINE OVERHAUL: 474. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.50 FINISH 84.00

ATMOSPHERIC PRESSURE: START 30.18 FINISH 30.18

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0150

RELATIVE HUMIDITY: 59.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 88.80, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED  
PROBE- 3 HOLE JURY RIG

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 480.00                   | 5                  | -0.00            | 6898.00                  | 700.00                  | -0.00    | 0.0                                 | -0.00                     | 0.0                          |
| -0.00      | 2/ 1      | 5600.00                  | 60                 | -0.00            | 10974.00                 | 4220.00                 | -0.00    | 0.0                                 | 2.04                      | 0.0                          |
| -0.00      | 3/ 2      | 7570.00                  | 81                 | -0.00            | 11569.00                 | 5850.00                 | -0.00    | 0.0                                 | 2.41                      | 0.0                          |
| -0.00      | 4/ 3      | 8230.00                  | 88                 | -0.00            | 11774.00                 | 6490.00                 | -0.00    | 0.0                                 | 2.55                      | 0.0                          |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SNOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 500.00                     | -0.00                     | 410.00        | 1.18                 | 309.00         | 9.90          | 5.00            | 14.90           | 9.00      | -0.00 | -0.00        |
| 60                       | 880.00                     | -0.00                     | 24.00         | 2.30                 | 15.00          | 50.00         | 8.00            | 58.00           | 1.00      | -0.00 | -0.00        |
| 81                       | 1040.00                    | 42.60                     | 19.00         | 2.67                 | 2.00           | 80.00         | 7.50            | 87.50           | 3.00      | -0.00 | -0.00        |
| 88                       | 1100.00                    | 46.70                     | 24.00         | 2.95                 | 1.40           | 90.00         | 6.00            | 96.00           | 2.00      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 65.54                     | 28.29                     | 1.31                       | 2963.93                    | 2.60                      | 3.91                       | 45.88             | 19.80             | 0.92               | 2074.75            | 1.82              | 2.74               |
| 60                       | 2.08                      | 0.75                      | 1.14                       | 3139.20                    | 7.13                      | 8.28                       | 8.80              | 3.15              | 4.82               | 13247.43           | 30.11             | 34.92              |
| 81                       | 1.42                      | 0.09                      | 0.92                       | 3142.05                    | 9.84                      | 10.76                      | 8.32              | 0.50              | 5.40               | 18381.00           | 57.57             | 62.97              |
| 88                       | 1.63                      | 0.05                      | 0.67                       | 3141.82                    | 10.02                     | 10.69                      | 10.56             | 0.35              | 4.34               | 20390.40           | 65.03             | 69.37              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 95.585         | 4322.395         | 41.258          | 3.791          | 1.915            | 5.706            |
| 60                       | 1.571          | 2365.613         | 0.562           | 5.376          | 0.860            | 6.236            |
| 81                       | 1.100          | 2428.138         | 0.066           | 7.606          | 0.713            | 8.319            |
| 88                       | 1.283          | 2477.571         | 0.043           | 7.902          | 0.527            | 8.429            |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 157 ENGINE TYPE AND MODEL: J52 - PBA SERIAL NUMBER: 636689  
RATED THRUST: 9300.  
ENGINE TOTAL TIME: 1310. HRS  
TIME SINCE HOT SECTION OVERHAUL: 328. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 328. HRS  
N2 COMPRESSOR OVERHAUL: 328. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 328. HRS  
N2 TURBINE OVERHAUL: 328. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.50 FINISH 82.00  
ATMOSPHERIC PRESSURE: START 30.06 FINISH 30.06  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0177  
RELATIVE HUMIDITY: 77.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 126.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 490.00                   | 5                  | -0.00            | 6742.00                  | 750.00                  | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 5200.00                  | 55                 | -0.00            | 1073.00                  | 3970.00                 | -0.00     | -0.000000                           | -0.00                     | 1.89                         |
| -0.00      | 3/ 2      | 6900.00                  | 74                 | -0.00            | 11202.00                 | 5315.00                 | -0.00     | -0.000000                           | -0.00                     | 2.21                         |
| -0.00      | 4/ 3      | 8040.00                  | 86                 | -0.00            | 11582.00                 | 6340.00                 | -0.00     | -0.000000                           | -0.00                     | 2.43                         |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP. DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO <sub>2</sub> (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO <sub>2</sub> (DRY) PPMV | NO <sub>x</sub> (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-----------------------------|---------------------------|---------------|---------------------------------|----------------|---------------|----------------------------|----------------------------|-----------|-------|--------------|
| 5                        | 520.00                      | -0.00                     | 605.00        | 1.28                            | 221.00         | 83.00         | 1.90                       | 84.90                      | 2.40      | -0.00 | -0.00        |
| 55                       | 845.00                      | 26.30                     | 90.00         | 2.29                            | 4.00           | 116.00        | 2.00                       | 118.00                     | 0.40      | -0.00 | -0.00        |
| 74                       | 983.00                      | 35.90                     | 57.00         | 3.21                            | 1.00           | 133.00        | 2.00                       | 135.00                     | 0.50      | -0.00 | -0.00        |
| 86                       | 1085.00                     | 42.10                     | 34.00         | 3.52                            | 0.50           | 154.00        | 2.00                       | 156.00                     | 0.30      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO <sub>2</sub> LB/1K LB FUEL | MASS EMI CO <sub>2</sub> LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NO <sub>x</sub> LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO <sub>2</sub> LB/HR | MASS EMI CO <sub>2</sub> LB/HR | MASS EMI NO LB/HR | MASS EMI NO <sub>x</sub> LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------------------|----------------------------------------|---------------------------|----------------------------------------|-------------------|-------------------|--------------------------------|--------------------------------|-------------------|--------------------------------|
| 5                        | 88.86                     | 18.59                     | 0.46                                   | 2953.91                                | 20.02                     | 20.48                                  | 66.64             | 13.94             | 0.34                           | 2215.43                        | 15.02             | 15.36                          |
| 55                       | 7.83                      | 0.20                      | 0.29                                   | 3131.67                                | 16.58                     | 16.87                                  | 31.10             | 0.79              | 1.14                           | 12432.73                       | 65.84             | 66.97                          |
| 74                       | 3.55                      | 0.04                      | 0.20                                   | 3138.85                                | 13.60                     | 13.80                                  | 18.85             | 0.19              | 1.09                           | 16683.00                       | 72.26             | 73.35                          |
| 86                       | 1.93                      | 0.02                      | 0.19                                   | 3141.45                                | 14.37                     | 14.55                                  | 12.24             | 0.10              | 1.18                           | 19916.77                       | 91.09             | 92.27                          |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO <sub>2</sub> LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO <sub>2</sub> LB/1K#TH-HR | NO <sub>x</sub> LB/1K#TH-HR |
|--------------------------|----------------|-----------------------------|-----------------|----------------|-----------------------------|-----------------------------|
| 5                        | 136.010        | 4521.281                    | 28.455          | 30.649         | 0.702                       | 31.350                      |
| 55                       | 5.980          | 2390.909                    | 0.152           | 12.661         | 0.218                       | 12.879                      |
| 74                       | 2.732          | 2417.826                    | 0.027           | 10.473         | 0.157                       | 10.630                      |
| 86                       | 1.523          | 2477.210                    | 0.013           | 11.330         | 0.147                       | 11.477                      |

DATE: 7/28/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 158 ENGINE TYPE AND MODEL: J52 - P8A SERIAL NUMBER: 661138  
RATED THRUST: 9300.

ENGINE TOTAL TIME: 884. HRS

TIME SINCE HOT SECTION OVERHAUL: 511. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 780. HRS  
N2 COMPRESSOR OVERHAUL: 648. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 511. HRS  
N2 TURBINE OVERHAUL: 511. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 82.00 FINISH 84.00

ATMOSPHERIC PRESSURE: START 30.01 FINISH 30.01

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0189

RELATIVE HUMIDITY: 77.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 121.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM |          | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEG REES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|----------|--------------------------|-------------------------|-----------|--------------------------------------|---------------------------|------------------------------|
|            |           |                          |                    | N1               | N2       |                          |                         |           |                                      |                           |                              |
| -0.00      | 1/ 0      | 7560.00                  | 81                 | -0.00            | 11609.00 | 5860.00                  | -0.00                   | -0.000000 | -0.00                                | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 5920.00                  | 63                 | -0.00            | 11160.00 | 4470.00                  | -0.00                   | -0.000000 | -0.00                                | -0.00                     | -0.00                        |
| -0.00      | 3/ 2      | 500.00                   | 5                  | -0.00            | 6900.00  | 710.00                   | -0.00                   | -0.000000 | -0.00                                | -0.00                     | -0.00                        |
| -0.00      | 4/ 3      | 8420.00                  | 90                 | -0.00            | 11892.00 | 6670.00                  | -0.00                   | -0.000000 | -0.00                                | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (CRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALOEHYOES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 63                       | 915.00                     | 31.90                     | 59.00         | 2.53                 | 2.00           | 40.00         | 3.00            | 43.00           | 0.10      | -0.00 | -0.00        |
| 5                        | 510.00                     | -0.00                     | 33.00         | 2.86                 | 0.50           | 53.00         | 3.00            | 56.00           | 0.05      | -0.00 | -0.00        |
| 90                       | 1148.00                    | 46.70                     | 32.00         | 3.14                 | 0.49           | 78.00         | 2.00            | 80.00           | 0.40      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
|                          |                           |                           |                            |                            |                           |                            |                   |                   |                    |                    |                   |                    |
| 63                       | 4.66                      | 0.09                      | 0.39                       | 3136.96                    | 5.18                      | 5.57                       | 20.81             | 0.40              | 1.74               | 14022.21           | 23.18             | 24.91              |
| 5                        | 2.31                      | 0.02                      | 0.34                       | 3140.85                    | 6.08                      | 6.43                       | 1.64              | 0.01              | 0.24               | 2230.00            | 4.37              | 4.56               |
| 90                       | 2.04                      | 0.02                      | 0.21                       | 3141.27                    | 8.16                      | 8.37                       | 13.59             | 0.12              | 1.40               | 20952.30           | 54.41             | 55.81              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                          |                |                  |                 |                |                  |                  |
| 63                       | 3.516          | 2368.618         | 0.068           | 3.915          | 0.294            | 4.208            |
| 5                        | 3.275          | 4460.000         | 0.028           | 8.640          | 0.489            | 9.129            |
| 90                       | 1.614          | 2488.397         | 0.014           | 6.462          | 0.166            | 6.628            |

DATE: 7/ 8/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK HAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 98 ENGINE TYPE AND MODEL: J52 - P8B SERIAL NUMBER: 677316  
RATED THRUST: 8500.

ENGINE TOTAL TIME: 310. HRS

TIME SINCE HOT SECTION OVERHAUL: 310. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 310. HRS  
N2 COMPRESSOR OVERHAUL: 310. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 310. HRS  
N1 TURBINE OVERHAUL: 310. HRS  
N2 TURBINE OVERHAUL: 310. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 85.50

ATMOSPHERIC PRESSURE: START 30.14 FINISH 30.14

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0120

RELATIVE HUMIDITY: 46.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 93.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 8

COMMENTS:

H/C CAL ESTIMATED  
SMOKELESS COMBUSTOR CAN

| CLOCK TIME | TEST MODE | POWER              |                    | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
|            |           | THRUST, LBS OR SHP | PERCENT RATED T.O. |                  |                          |                         |          |                                     |                           |                              |
| -0.00      | 5/ 0      | 470.00             | 5                  | -0.00            | 6870.00                  | 685.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 6/ 5      | 480.00             | 5                  | -0.00            | 6910.00                  | 700.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 1/ 6      | -0.00              | 0                  | -0.00            | -0.00                    | -0.00                   | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 5360.00            | 63                 | -0.00            | 10958.00                 | 4050.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 7/ 2      | 7210.00            | 84                 | -0.00            | 11565.00                 | 5515.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 8/ 7      | 7240.00            | 85                 | -0.00            | 11570.00                 | 5550.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 9/ 8      | 7240.00            | 85                 | -0.00            | 11569.00                 | 5540.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 10/ 9     | 8225.00            | 96                 | -0.00            | 11890.00                 | 6455.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 5                        | 500.00                     | -0.00                     | 340.00        | 0.85                 | 225.00         | 5.00          | 8.00            | 4.90            | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 330.00        | 1.07                 | 262.00         | 10.00         | 8.00            | 4.90            | 3.00      | -0.00 | -0.00        |
| 63                       | 865.00                     | 29.00                     | 32.00         | 2.20                 | 23.00          | 55.00         | 11.00           | 57.00           | -0.00     | -0.00 | -0.00        |
| 84                       | 1009.00                    | 40.20                     | 23.00         | 2.58                 | -0.00          | 85.00         | 10.00           | 80.00           | 0.10      | -0.00 | -0.00        |
| 85                       | 1015.00                    | 40.40                     | 22.00         | 2.58                 | -0.00          | 80.00         | 10.00           | 78.00           | -0.00     | -0.00 | -0.00        |
| 85                       | 1010.00                    | 40.40                     | 21.00         | 2.58                 | 5.00           | 75.00         | 11.00           | 78.00           | -0.00     | -0.00 | -0.00        |
| 96                       | 1120.00                    | 46.20                     | 20.00         | 2.78                 | 4.00           | 90.00         | 10.00           | 90.00           | 0.10      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
|                          |                           |                           |                            |                            |                           |                            |                   |                   |                    |                    |                   |                    |
| 5                        | 75.06                     | 28.45                     | 2.90                       | 2948.53                    | 1.81                      | 1.78                       | 52.54             | 19.91             | 2.03               | 2063.97            | 1.27              | 1.24               |
| 0                        | 58.49                     | 26.59                     | 2.33                       | 2979.67                    | 2.91                      | 1.43                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 63                       | 2.90                      | 1.20                      | 1.64                       | 3136.68                    | 8.20                      | 8.50                       | 11.76             | 4.84              | 6.64               | 12703.56           | 33.20             | 34.41              |
| 84                       | 1.78                      | -0.00                     | 1.27                       | 3141.72                    | 10.82                     | 10.18                      | 9.83              | -0.00             | 7.02               | 17326.60           | 59.68             | 56.16              |
| 85                       | 1.71                      | -0.00                     | 1.27                       | 3141.85                    | 10.18                     | 9.93                       | 9.46              | -0.00             | 7.07               | 17437.24           | 56.92             | 55.11              |
| 85                       | 1.63                      | 0.22                      | 1.40                       | 3141.36                    | 9.55                      | 9.93                       | 9.02              | 1.23              | 7.76               | 17403.13           | 52.89             | 55.00              |
| 96                       | 1.44                      | 0.16                      | 1.18                       | 3141.81                    | 10.63                     | 10.63                      | 9.29              | 1.06              | 7.63               | 20280.39           | 68.64             | 68.64              |

| POWER PERCENT RATED T.O.                              | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|-------------------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                                                       |                |                  |                 |                |                  |                  |
| 5                                                     | 109.467        | 4299.941         | 41.489          | 2.644          | 4.731            | 2.591            |
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                |                  |                 |                |                  |                  |
| 63                                                    | 2.194          | 2370.067         | 0.903           | 6.194          | 1.239            | 6.419            |
| 84                                                    | 1.363          | 2403.134         | -0.000          | 8.277          | 0.974            | 7.790            |
| 85                                                    | 1.307          | 2408.459         | -0.000          | 7.807          | 0.976            | 7.612            |
| 85                                                    | 1.245          | 2403.747         | 0.170           | 7.305          | 1.071            | 7.597            |
| 96                                                    | 1.129          | 2465.701         | 0.129           | 8.345          | 0.927            | 8.345            |

DATE: 7/12/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 100 ENGINE TYPE AND MODEL: J57 - P10 SERIAL NUMBFR: 628305

RATED THRUST: 10500.

ENGINE TOTAL TIME: 3395. HRS

TIME SINCE HOT SECTION OVERHAUL: 1074. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 1074. HRS  
N2 COMPRESSOR OVERHAUL: 1074. HRS  
COMBUSTOR CAN REPLACEMENT: 1074. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 1074. HRS  
N1 TURBINE OVERHAUL: 1074. HRS  
N2 TURBINE OVERHAUL: 1074. HRS

FUEL: JP-5 FUEL M/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 73.50 FINISH 76.00

ATMOSPHERIC PRESSURE: START 30.03 FINISH 30.06

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0134

RELATIVE HUMIDITY: 75.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 115.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 8

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DFGRFES F | ENGINE PRESSURE RATIO EPA | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                    |                          | N1               | N2                       |                         |          |                                     |                           |                              |
| -0.00      | 1/ 0      | -0.00              | 0                        | -0.00            | -0.00                    | -0.00                   | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 11/ 1     | 540.00             | 5                        | 2185.00          | 5912.00                  | 1100.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 12/11     | 510.00             | 4                        | 2160.00          | 5874.00                  | 1080.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 13/12     | 6320.00            | 60                       | 5445.00          | 8748.00                  | 5300.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 14/13     | -0.00              | 0                        | 5780.00          | 9050.00                  | 6900.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 15/14     | 9540.00            | 90                       | 5935.00          | 9228.00                  | 7770.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 10/15     | 9450.00            | 89                       | 5935.00          | 9230.00                  | 7770.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 16/10     | 9420.00            | 89                       | 5930.00          | 9240.00                  | 7700.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | -0.00                      | -0.00                     | 675.00        | 1.36                 | 1220.00        | 5.00          | 5.00            | 10.00           | -0.00     | -0.00 | -0.00        |
| 5                        | 543.00                     | -0.00                     | 645.00        | 1.29                 | 1080.00        | 4.90          | 3.00            | 4.90            | 9.10      | -0.00 | -0.00        |
| 4                        | 543.00                     | -0.00                     | 645.00        | 1.31                 | 1150.00        | 4.90          | 3.00            | 4.90            | -0.00     | -0.00 | -0.00        |
| 60                       | 910.00                     | 26.50                     | 42.00         | 2.22                 | -0.00          | 40.00         | 4.00            | 36.00           | 1.30      | -0.00 | -0.00        |
| 0                        | 1040.00                    | 35.70                     | 34.00         | 2.60                 | -0.00          | 60.00         | 6.00            | 56.00           | 1.20      | -0.00 | -0.00        |
| 90                       | 1085.00                    | 40.90                     | 30.00         | 2.73                 | -0.00          | 67.00         | 5.00            | 65.00           | 0.80      | -0.00 | -0.00        |
| 89                       | 1085.00                    | 40.80                     | 29.00         | 2.67                 | -0.00          | 64.00         | 4.00            | 64.00           | -0.00     | -0.00 | -0.00        |
| 89                       | 1070.00                    | 40.70                     | 31.00         | 2.72                 | -0.00          | 63.00         | 3.00            | 64.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 87.18                     | 90.25                     | 1.06                       | 2759.96                    | 1.06                      | 2.12                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 5                        | 88.26                     | 84.64                     | 0.67                       | 2773.63                    | 1.10                      | 1.10                       | 97.09             | 93.11             | 0.74               | 3051.00            | 1.21              | 1.21               |
| 4                        | 86.66                     | 88.50                     | 0.66                       | 2765.58                    | 1.08                      | 1.08                       | 93.60             | 95.57             | 0.72               | 2986.83            | 1.17              | 1.17               |
| 60                       | 3.78                      | -0.00                     | 0.59                       | 3138.59                    | 5.91                      | 5.32                       | 20.03             | -0.00             | 3.13               | 16634.50           | 31.33             | 28.20              |
| 0                        | 2.61                      | -0.00                     | 0.76                       | 3140.42                    | 7.58                      | 7.07                       | 18.03             | -0.00             | 5.23               | 21668.87           | 52.28             | 48.79              |
| 90                       | 2.20                      | -0.00                     | 0.60                       | 3141.07                    | 8.06                      | 7.82                       | 17.07             | -0.00             | 4.67               | 24406.13           | 62.62             | 60.75              |
| 89                       | 2.17                      | -0.00                     | 0.49                       | 3141.11                    | 7.87                      | 7.87                       | 16.87             | -0.00             | 3.82               | 24406.45           | 61.16             | 61.16              |
| 89                       | 2.28                      | -0.00                     | 0.36                       | 3140.94                    | 7.61                      | 7.73                       | 17.54             | -0.00             | 2.79               | 24185.26           | 58.56             | 59.49              |

| POWER PERCENT RATED T.O.                              | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|-------------------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                |                  |                 |                |                  |                  |
| 5                                                     | 179.796        | 5649.992         | 172.421         | 2.244          | 1.374            | 2.244            |
| 4                                                     | 183.523        | 5856.520         | 187.402         | 2.290          | 1.402            | 2.290            |
| 60                                                    | 3.169          | 2632.042         | -0.000          | 4.958          | 0.496            | 4.462            |
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                |                  |                 |                |                  |                  |
| 90                                                    | 1.789          | 2558.295         | -0.000          | 6.564          | 0.490            | 6.368            |
| 89                                                    | 1.785          | 2582.693         | -0.000          | 6.472          | 0.404            | 6.472            |
| 89                                                    | 1.862          | 2567.438         | -0.000          | 6.217          | 0.296            | 6.315            |

DATE: 7/15/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA .....

CAL ID NUMBER: 103 ENGINE TYPE AND MODEL: J57 - P10 SERIAL NUMBER: 628115  
RATED THRUST: 10500.

ENGINE TOTAL TIME: 337. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.50

ATMOSPHERIC PRESSURE: START 29.85 FINISH 29.86

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0114

RELATIVE HUMIDITY: 4.70 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 98.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK<br>TIME | TEST<br>MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>FPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| -0.00         | 1/ 0         | -0.00                    | 0                                 | -0.00 5957.00                   | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 2/ 1         | 6076.00                  | 57                                | 5465.00 8915.00                 | 5130.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.79                               | -0.00                                 |
| -0.00         | 3/ 2         | 8063.00                  | 76                                | 5800.00 9215.00                 | 6630.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.09                               | -0.00                                 |
| -0.00         | 4/ 3         | -0.00                    | 0                                 | -0.00 9401.00                   | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                 | -0.00                               | -0.00                              | 582.00              | 1.00                          | 583.00               | 11.00               | 2.00                     | 7.00                     | 8.90      | -0.00 | -0.00        |
| 57                                | 940.00                              | 23.40                              | 53.00               | 2.10                          | 7.00                 | 38.00               | 7.00                     | 39.00                    | 1.00      | -0.00 | -0.00        |
| 76                                | 1050.00                             | 32.30                              | 34.00               | 2.46                          | 2.00                 | 68.00               | 4.00                     | 61.00                    | 0.30      | -0.00 | -0.00        |
| 0                                 | -0.00                               | -0.00                              | 35.00               | 2.64                          | 2.00                 | 79.00               | 4.00                     | 81.00                    | 2.00      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                 | 104.32                             | 59.85                              | 0.59                                | 2816.41                             | 3.24                               | 2.06                                | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 57                                | 5.04                               | 0.38                               | 1.09                                | 3135.57                             | 5.93                               | 6.09                                | 25.84                   | 1.95                    | 5.61                     | 16085.45                 | 30.43                   | 31.23                    |
| 76                                | 2.76                               | 0.09                               | 0.53                                | 3139.93                             | 9.07                               | 8.14                                | 18.31                   | 0.62                    | 3.54                     | 20817.73                 | 60.16                   | 53.96                    |
| 0                                 | 2.65                               | 0.09                               | 0.50                                | 3140.12                             | 9.82                               | 10.07                               | -0.00                   | -0.00                   | -0.00                    | -0.00                    | -0.00                   | -0.00                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

|    |       |          |       |       |       |       |
|----|-------|----------|-------|-------|-------|-------|
| 57 | 4.252 | 2647.375 | 0.322 | 5.008 | 0.923 | 5.140 |
| 76 | 2.271 | 2581.885 | 0.077 | 7.461 | 0.439 | 6.693 |

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK HAS

ENGINE DATA .....

CAL ID NUMBER: 105 ENGINE TYPE AND MODEL: J57 - P10 SERIAL NUMBER: P606907  
RATED THRUST: 10500.

ENGINE TOTAL TIME: 3415. HRS

TIME SINCE HOT SECTION OVERHAUL: 586. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 586. HRS  
N2 COMPRESSOR OVERHAUL: 586. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 586. HRS  
N2 TURBINE OVERHAUL: 586. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 84.00 FINISH 84.50

ATMOSPHERIC PRESSURE: START 29.87 FINISH 29.87

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0167

RELATIVE HUMIDITY: 67.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 110.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 11/ 0     | 430.00                   | 4                  | 2150.00          | 5900.00                  | 1060.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 13/11     | 6080.00                  | 57                 | 5500.00          | 8921.00                  | 5030.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 14/13     | 7940.00                  | 75                 | 5820.00          | 9218.00                  | 6450.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 15/14     | 9420.00                  | 89                 | 6060.00          | 9455.00                  | 7680.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 573.00                     | -0.00                     | 590.00        | 1.14                 | 1140.00        | 7.00          | 2.90            | 7.00            | 18.90     | -0.00 | -0.00        |
| 57                       | 885.00                     | 24.00                     | 36.00         | 2.09                 | 4.65           | 30.00         | 3.00            | 36.00           | 1.50      | -0.00 | -0.00        |
| 75                       | 990.00                     | 32.40                     | 27.00         | 2.44                 | 2.00           | 43.00         | 3.00            | 56.00           | 1.10      | -0.00 | -0.00        |
| 89                       | 1075.00                    | 39.00                     | 20.00         | 2.80                 | 2.00           | 67.00         | 3.00            | 75.00           | 0.20      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 89.93                     | 99.52                     | 0.73                       | 2730.21                    | 1.75                      | 1.75                       | 95.33             | 105.49            | 0.77               | 2894.02            | 1.86              | 1.86               |
| 57                       | 3.44                      | 0.25                      | 0.47                       | 3138.42                    | 4.71                      | 5.65                       | 17.31             | 1.28              | 2.37               | 15786.26           | 23.69             | 28.43              |
| 75                       | 2.21                      | 0.09                      | 0.40                       | 3140.79                    | 5.79                      | 7.54                       | 14.27             | 0.61              | 2.60               | 20258.10           | 37.32             | 48.60              |
| 89                       | 1.43                      | 0.08                      | 0.35                       | 3142.06                    | 7.86                      | 8.80                       | 10.97             | 0.63              | 2.70               | 24130.99           | 60.36             | 67.57              |

| POWER PERCENT RATED T.O. | CO LB/1K0TH-HR | CO 2 LB/1K0TH-HR | THC LB/1K0TH-HR | NO LB/1K0TH-HR | NO 2 LB/1K0TH-HR | NO X LB/1K0TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 221.688        | 6730.273         | 245.324         | 4.320          | 1.790            | 4.320            |
| 57                       | 2.846          | 2596.424         | 0.211           | 3.896          | 0.390            | 4.675            |
| 75                       | 1.797          | 2551.398         | 0.076           | 4.700          | 0.328            | 6.122            |
| 89                       | 1.165          | 2561.676         | 0.067           | 6.408          | 0.287            | 7.173            |

DATE: 7/ 6/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 108 ENGINE TYPE AND MODEL: J57 - P10 SERIAL NUMBER: P631861  
RATED THRUST: 10500.

ENGINE TOTAL TIME: 3509. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 29.84 FINISH 29.85

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0195

RELATIVE HUMIDITY: 92.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 98.80, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED  
PROBE- 3 HOLE JURY RIG

| CLOCK TIME | TEST MODE | THRUST, LBS<br>DR SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|-----------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| -0.00      | 1/ 0      | 420.00                | 3                                 | 2140.00 5897.00                 | 1100.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 2/ 1      | 6334.00               | 60                                | 5420.00 8893.00                 | 5187.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.84                               | -0.00                                 |
| -0.00      | 3/ 2      | 7916.00               | 75                                | 5780.00 9147.00                 | 6390.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.08                               | -0.00                                 |
| -0.00      | 4/ 3      | 9675.00               | 92                                | 6020.00 9405.00                 | 7770.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.35                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(CRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 3                                 | 573.00                              | -0.00                              | 665.00              | 1.24                          | 1340.00              | 10.00               | 5.00                     | 15.00                    | 2.00      | -0.00 | -0.00        |
| 60                                | 890.00                              | 25.00                              | 50.00               | 1.96                          | 33.00                | 20.00               | 12.50                    | 32.50                    | 1.00      | -0.00 | -0.00        |
| 75                                | 980.00                              | 32.00                              | 30.00               | 2.25                          | 28.00                | 33.00               | 10.00                    | 43.00                    | 0.30      | -0.00 | -0.00        |
| 92                                | 1080.00                             | 39.90                              | 24.00               | 2.55                          | 26.20                | 52.00               | 10.00                    | 62.00                    | 0.10      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 3                                 | 92.39                              | 106.62                             | 1.14                                | 2706.85                             | 2.28                               | 3.42                                | 101.63                  | 117.29                  | 1.26                     | 2977.53                  | 2.51                    | 3.77                     |
| 60                                | 5.08                               | 1.92                               | 2.09                                | 3131.27                             | 3.34                               | 5.43                                | 26.37                   | 9.97                    | 10.83                    | 16241.87                 | 17.33                   | 28.15                    |
| 75                                | 2.66                               | 1.42                               | 1.46                                | 3136.44                             | 4.81                               | 6.27                                | 17.01                   | 9.09                    | 9.31                     | 20041.84                 | 30.73                   | 40.04                    |
| 92                                | 1.88                               | 1.18                               | 1.29                                | 3138.35                             | 6.69                               | 7.98                                | 14.61                   | 9.13                    | 10.00                    | 24384.46                 | 51.98                   | 61.98                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 3                                 | 241.974           | 7089.355               | 279.253            | 5.577             | 2.988                  | 8.965                  |
| 60                                | 4.163             | 2564.237               | 1.574              | 2.735             | 1.710                  | 4.445                  |
| 75                                | 2.148             | 2531.814               | 1.148              | 3.882             | 1.176                  | 5.058                  |
| 92                                | 1.510             | 2520.409               | 0.944              | 5.373             | 1.033                  | 6.406                  |

DATE: 7/20/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 144 ENGINE TYPE AND MODEL: J57 - P10 SERIAL NUMBER: P626995  
 RATED THRUST: 10500.  
 ENGINE TOTAL TIME: 5141. HRS  
 TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
 TIME SINCE:  
 N1 COMPRESSOR OVERHAUL: 0. HRS  
 N2 COMPRESSOR OVERHAUL: 0. HRS  
 COMBUSTOR CAN REPLACEMENT: 0. HRS  
 FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
 N1 TURBINE OVERHAUL: 0. HRS  
 N2 TURBINE OVERHAUL: 0. HRS  
 FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 76.00  
 ATMOSPHERIC PRESSURE: START 29.96 FINISH 29.98  
 INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0154  
 RELATIVE HUMIDITY: 77.00 PERCENT  
 SAMPLE LINE: TEMPERATURE, DEGREES C: 115.50; FLOW RATE, LITERS/MIN: -0.00  
 SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

ALL H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM |         | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|---------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
|            |           |                    |                          | N1               | N2      |                          |                         |           |                                     |                           |                              |
| -0.00      | 1/ 0      | -0.00              | 0                        | -0.00            | -0.00   | -0.00                    | -0.00                   | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 6430.00            | 61                       | 5535.00          | 8928.00 | 5120.00                  | -0.00                   | -0.000000 | -0.00                               | 1.84                      | -0.00                        |
| -0.00      | 3/ 2      | 8218.00            | 78                       | 5800.00          | 9218.00 | 6510.00                  | -0.00                   | -0.000000 | -0.00                               | 2.12                      | -0.00                        |
| -0.00      | 4/ 3      | 9530.00            | 90                       | 6000.00          | 9415.00 | 7560.00                  | -0.00                   | -0.000000 | -0.00                               | 2.33                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
|                          |                            |                           |               |                      |                |               |                 |                 |           |       |              |
| 61                       | 880.00                     | 25.00                     | 45.00         | 2.10                 | 3.00           | 37.00         | 5.00            | 40.00           | 2.00      | -0.00 | -0.00        |
| 78                       | 995.00                     | 33.20                     | 33.00         | 2.59                 | 1.00           | 53.00         | 4.00            | 60.00           | 0.90      | -0.00 | -0.00        |
| 90                       | 1070.00                    | 39.30                     | 30.00         | 2.75                 | 0.49           | 68.00         | 4.00            | 77.00           | 0.50      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
|                          |                           |                           |                            |                            |                           |                            |                   |                   |                    |                    |                   |                    |
| 61                       | 4.28                      | 0.16                      | 0.78                       | 3137.35                    | 5.78                      | 6.25                       | 21.91             | 0.84              | 4.00               | 16063.24           | 29.59             | 31.99              |
| 78                       | 2.55                      | 0.04                      | 0.51                       | 3140.40                    | 6.72                      | 7.61                       | 16.58             | 0.29              | 3.30               | 20444.01           | 43.73             | 49.51              |
| 90                       | 2.18                      | 0.02                      | 0.48                       | 3141.04                    | 8.12                      | 9.19                       | 16.49             | 0.15              | 3.61               | 23746.28           | 61.38             | 69.51              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|                          |                |                  |                 |                |                  |                  |
| 61                       | 3.407          | 2498.172         | 0.130           | 4.601          | 0.622            | 4.974            |
| 78                       | 2.017          | 2487.712         | 0.035           | 5.322          | 0.402            | 6.025            |
| 90                       | 1.730          | 2491.740         | 0.016           | 6.441          | 0.379            | 7.294            |

DATE: 7/22/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 145 ENGINE TYPE AND MODEL: J57 - P10 SERIAL NUMBER: P604897  
RATED THRUST: 10500.  
ENGINE TOTAL TIME: 4146. HRS  
TIME SINCE HDT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 80.00  
ATMOSPHERIC PRESSURE: START 30.12 FINISH 30.14  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0127  
RELATIVE HUMIDITY: 59.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 108.90, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 470.00                   | 4                  | 2135.00          | 5926.00                  | 1070.00                 | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 6185.00                  | 58                 | 5465.00          | 8860.00                  | 5050.00                 | -0.000000 | -0.00                               | 1.81                      | -0.00                        |
| -0.00      | 3/ 2      | 8161.00                  | 77                 | 5800.00          | 9173.00                  | 6510.00                 | -0.000000 | -0.00                               | 2.11                      | -0.00                        |
| -0.00      | 4/ 3      | 9507.00                  | 90                 | 6010.00          | 9381.00                  | 7600.00                 | -0.000000 | -0.00                               | 2.31                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 4                        | 575.00                     | -0.00                     | 620.00        | 1.21                 | 1240.00        | 10.00         | 2.90            | 12.90           | -0.00     | -0.00 | -0.00        |
| 58                       | 915.00                     | 24.30                     | 58.00         | 1.96                 | 13.00          | 28.00         | 3.00            | 31.00           | -0.00     | -0.00 | -0.00        |
| 77                       | 1040.00                    | 33.10                     | 39.00         | 2.29                 | 4.00           | 50.00         | 3.00            | 53.00           | -0.00     | -0.00 | -0.00        |
| 90                       | 1120.00                    | 39.10                     | 32.00         | 2.56                 | 2.00           | 68.00         | 3.00            | 71.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NDX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 4                        | 88.88                     | 101.81                    | 0.68                       | 2725.56                    | 2.35                      | 3.04                       | 95.11             | 108.94            | 0.73               | 2916.34            | 2.52              | 3.25               |
| 58                       | 5.90                      | 0.76                      | 0.50                       | 3133.17                    | 4.68                      | 5.18                       | 29.80             | 3.83              | 2.53               | 15822.52           | 23.63             | 26.16              |
| 77                       | 3.40                      | 0.20                      | 0.43                       | 3138.63                    | 7.16                      | 7.59                       | 22.15             | 1.30              | 2.80               | 20432.48           | 46.64             | 49.44              |
| 90                       | 2.50                      | 0.09                      | 0.38                       | 3140.35                    | 8.72                      | 9.10                       | 18.99             | 0.68              | 2.92               | 23866.68           | 66.27             | 69.20              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 4                        | 202.353        | 6204.984         | 231.785         | 5.361          | 1.555            | 6.916            |
| 58                       | 4.818          | 2558.209         | 0.618           | 3.821          | 0.409            | 4.230            |
| 77                       | 2.714          | 2503.674         | 0.159           | 5.715          | 0.343            | 6.058            |
| 90                       | 1.997          | 2510.432         | 0.071           | 6.971          | 0.308            | 7.279            |

DATE: 0/70/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA .....

CAL ID NUMBER: 14 ENGINE TYPE AND MODEL: J-79 SERIAL NUMBER: GE 418312A  
RATED THRUST: 10350.

ENGINE TOTAL TIME: 1492. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 89.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 29.34 FINISH 29.34

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0176

RELATIVE HUMIDITY: 52.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 5

COMMENTS:

AIRFLOW DATA NOT AVAILABLE FOR N1 LESS THAN 6000, F/A CALCULATED FROM EXHAUST  
COMP.: NO2 DATA OBTAINED BY SUBTRACTION

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 0.0             | 7/ 0         | 260.00                            | 2                        | 5030.00                | -0.00                             | 1200.00                       | 46.30       | 0.007200                                     | -0.00                              | -0.00                                 |
| 7.15            | 3/ 7         | 10080.00                          | 97                       | 7690.00                | -0.00                             | 8850.00                       | 163.40      | 0.015000                                     | -0.00                              | -0.00                                 |
| 19.00           | 2/ 3         | 9230.00                           | 89                       | 7360.00                | -0.00                             | 8100.00                       | 156.00      | 0.014400                                     | -0.00                              | -0.00                                 |
| 29.00           | 1/ 2         | 6140.00                           | 59                       | 6830.00                | -0.00                             | 5200.00                       | 125.50      | 0.011500                                     | -0.00                              | -0.00                                 |
| 40.30           | 7/ 1         | 290.00                            | 2                        | 5015.00                | -0.00                             | 1150.00                       | 44.40       | 0.007200                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST...<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|---------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 2                                 | 666.00                              | -0.00                                 | 317.00              | 1.45                          | 112.00               | 4.00                | 6.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 97                                | 1165.00                             | -0.00                                 | -0.00               | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 89                                | 1142.00                             | -0.00                                 | -0.00               | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 59                                | 949.00                              | -0.00                                 | -0.00               | -0.00                         | -0.00                | -0.00               | -0.00                    | -0.00                    | -0.00     | -0.00 | -0.00        |
| 2                                 | 680.00                              | -0.00                                 | 300.00              | 1.45                          | 80.00                | 8.00                | 4.00                     | 17.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 2                                 | 42.42                              | 8.58                               | 1.32                                | 3048.67                             | 0.88                               | 2.20                                | 50.90                   | 10.30                   | 1.58                     | 3658.41                  | 1.06                    | 2.64                     |
| 97                                | 0.20                               | 0.11                               | 0.33                                | 3138.25                             | 0.33                               | 0.66                                | 1.77                    | 1.01                    | 2.90                     | 27773.48                 | 2.90                    | 5.81                     |
| 89                                | 0.20                               | 0.11                               | 0.33                                | 3138.25                             | 0.33                               | 0.66                                | 1.62                    | 0.93                    | 2.66                     | 25419.80                 | 2.66                    | 5.31                     |
| 59                                | 0.20                               | 0.11                               | 0.33                                | 3138.25                             | 0.33                               | 0.66                                | 1.04                    | 0.59                    | 1.71                     | 16318.88                 | 1.71                    | 3.41                     |
| 2                                 | 40.28                              | 6.15                               | 0.88                                | 3058.72                             | 1.76                               | 2.65                                | 46.32                   | 7.07                    | 1.01                     | 3517.52                  | 2.03                    | 3.04                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 2                                 | 195.782           | 14070.805              | 39.617             | 4.058             | 6.087                  | 10.145                 |
| 97                                | 0.175             | 2755.306               | 0.100              | 0.288             | 0.288                  | 0.576                  |
| 89                                | 0.175             | 2748.086               | 0.100              | 0.287             | 0.287                  | 0.575                  |
| 59                                | 0.169             | 2657.799               | 0.097              | 0.278             | 0.278                  | 0.556                  |
| 2                                 | 159.718           | 12129.383              | 24.393             | 6.996             | 3.498                  | 10.494                 |

DATE: 7/ 1/71

TEST ORGANIZATION: S M R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 15 ENGINE TYPE AND MODEL: J-79 SERIAL NUMBER: GE 434176

RATED THRUST: 10350.

ENGINE TOTAL TIME: 1492. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 29.26 FINISH 29.26

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0159

RELATIVE HUMIDITY: 53.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 5

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR INITIAL AND FINAL RUNS.  
NO2 DETERMINED BY SUBTRACTION HC FOR FIRST RUN STILL SLOWLY DECREASING AT END OF MODE

| ELAPSED TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1    | N2    | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|--------------|-----------|--------------------------|--------------------|------------------|-------|-------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| 0.0          | 7/ 0      | 275.00                   | 2                  | 5060.00          | -0.00 | -0.00 | 1275.00                  | 48.50                   | 0.007300 | -0.00                               | -0.00                     | -0.00                        |
| 16.25        | 1/ 7      | 6650.00                  | 64                 | 6910.00          | -0.00 | -0.00 | 5775.00                  | 129.70                  | 0.012400 | -0.00                               | -0.00                     | -0.00                        |
| 27.15        | 2/ 1      | 9500.00                  | 91                 | 7400.00          | -0.00 | -0.00 | 8350.00                  | 156.40                  | 0.014800 | -0.00                               | -0.00                     | -0.00                        |
| 37.45        | 3/ 2      | 10100.00                 | 97                 | 7660.00          | -0.00 | -0.00 | 8875.00                  | 162.10                  | 0.015200 | -0.00                               | -0.00                     | -0.00                        |
| 47.40        | 7/ 3      | 300.00                   | 2                  | 5060.00          | -0.00 | -0.00 | 1100.00                  | 43.70                   | 0.007000 | -0.00                               | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (WET) PPMV | CO 2 (WET) PERCENT V | THC (WET) PPMV | NO (WET) PPMV | NO 2 (WET) PPMV | NO X (WET) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 2                        | 675.00                     | -0.00                     | 402.00        | 1.48                 | 275.00         | 8.00          | 3.00            | 11.00           | -0.00     | -0.00 | -0.00        |
| 64                       | 960.00                     | -0.00                     | 44.00         | 2.33                 | 1.00           | 39.00         | 4.00            | 43.00           | -0.00     | -0.00 | -0.00        |
| 91                       | 1135.00                    | -0.00                     | 29.00         | 2.75                 | 0.0            | 62.00         | 6.00            | 68.00           | -0.00     | -0.00 | -0.00        |
| 97                       | 1156.00                    | -0.00                     | 23.00         | 2.77                 | 0.0            | 70.00         | 7.00            | 77.00           | -0.00     | -0.00 | -0.00        |
| 2                        | 640.00                     | -0.00                     | 339.00        | 1.41                 | 60.00          | 11.00         | 4.00            | 15.00           | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 2                        | 51.89                     | 20.33                     | 0.64                       | 3001.57                    | 1.70                      | 2.33                       | 66.16             | 25.92             | 0.81               | 3827.01            | 2.16              | 2.97               |
| 64                       | 3.77                      | 0.05                      | 0.56                       | 3132.82                    | 5.48                      | 6.04                       | 21.74             | 0.28              | 3.25               | 18092.05           | 31.66             | 34.90              |
| 91                       | 2.10                      | 0.0                       | 0.72                       | 3135.57                    | 7.39                      | 8.11                       | 17.57             | 0.0               | 5.97               | 26181.96           | 61.71             | 67.68              |
| 97                       | 1.66                      | 0.0                       | 0.83                       | 3136.27                    | 8.29                      | 9.11                       | 14.71             | 0.0               | 7.35               | 27834.39           | 73.53             | 80.89              |
| 2                        | 46.71                     | 4.73                      | 0.91                       | 3052.50                    | 2.49                      | 3.39                       | 51.38             | 5.21              | 1.00               | 3357.74            | 2.74              | 3.73               |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 2                        | 240.576        | 13916.387        | 94.255          | 7.864          | 2.949            | 10.813           |
| 64                       | 3.270          | 2720.609         | 0.043           | 4.761          | 0.488            | 5.249            |
| 91                       | 1.850          | 2755.996         | 0.0             | 6.496          | 0.629            | 7.124            |
| 97                       | 1.456          | 2755.879         | 0.0             | 7.280          | 0.728            | 8.009            |
| 2                        | 171.265        | 11192.477        | 17.361          | 9.128          | 3.319            | 12.447           |

OATE: 7/ 2/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 16 ENGINE TYPE AND MODEL: J-79 SERIAL NUMBER: GE-E418975  
RATED THRUST: 10350.

ENGINE TOTAL TIME: 2075. HRS

TIME SINCE HDT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL H/C RATIO: 1.995

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 91.00 FINISH 89.00

ATMOSPHERIC PRESSURE: START 29.26 FINISH 29.26

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0153

RELATIVE HUMIDITY: 43.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 5

COMMENTS:

F/A CALCULATION BASED ON EXHAUST COMPOSITION FOR INITIAL AND FINAL RUNS.

NO2 DETERMINED BY SUBTRACTION

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|-----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|                 |              |                                   |                          | N1                     | N2                                |                               |             |                                              |                                    |                                       |
| 0.0             | 7/ 0         | 320.00                            | 3                        | 5050.00                | -0.00                             | 1200.00                       | 43.80       | 0.007600                                     | -0.00                              | -0.00                                 |
| 11.05           | 3/ 7         | 1000.00                           | 9                        | 7685.00                | -0.00                             | 8775.00                       | 161.50      | 0.015100                                     | -0.00                              | -0.00                                 |
| 20.15           | 2/ 3         | 9200.00                           | 88                       | 7380.00                | -0.00                             | 8000.00                       | 153.90      | 0.014400                                     | -0.00                              | -0.00                                 |
| 30.00           | 1/ 2         | 6150.00                           | 59                       | 6910.00                | -0.00                             | 5150.00                       | 128.10      | 0.011200                                     | -0.00                              | -0.00                                 |
| 39.30           | 7/ 1         | 340.00                            | 3                        | 5060.00                | -0.00                             | 1180.00                       | 43.70       | 0.007500                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 3                                 | 665.00                              | -0.00                              | 371.00              | 1.53                          | 124.00               | 7.00                | 4.00                     | 11.00                    | -0.00     | -0.00 | -0.00        |
| 9                                 | 1157.00                             | -0.00                              | 23.00               | 2.45                          | 1.00                 | 71.00               | 5.00                     | 76.00                    | -0.00     | -0.00 | -0.00        |
| 88                                | 1130.00                             | -0.00                              | 43.00               | 2.68                          | 1.00                 | 56.00               | 5.00                     | 61.00                    | -0.00     | -0.00 | -0.00        |
| 59                                | 909.00                              | -0.00                              | 38.00               | 2.19                          | 0.0                  | 32.00               | 4.00                     | 36.00                    | -0.00     | -0.00 | -0.00        |
| 3                                 | 649.00                              | -0.00                              | 305.00              | 1.91                          | 62.00                | 7.00                | 3.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 3                                 | 46.92                              | 8.98                               | 0.83                                | 3040.50                             | 1.45                               | 2.29                                | 56.31                   | 10.78                   | 1.00                     | 3648.60                  | 1.75                    | 2.74                     |
| 9                                 | 1.61                               | 0.04                               | 0.58                                | 3136.23                             | 8.17                               | 8.74                                | 14.14                   | 0.35                    | 5.05                     | 27520.44                 | 71.67                   | 76.72                    |
| 88                                | 3.20                               | 0.04                               | 0.61                                | 3133.73                             | 6.85                               | 7.46                                | 25.60                   | 0.34                    | 4.89                     | 25069.82                 | 54.76                   | 59.65                    |
| 59                                | 3.46                               | 0.0                                | 0.60                                | 3133.43                             | 4.79                               | 5.38                                | 17.87                   | 0.0                     | 3.08                     | 16137.19                 | 24.65                   | 27.73                    |
| 3                                 | 39.39                              | 4.59                               | 0.64                                | 3064.39                             | 1.49                               | 2.12                                | 46.48                   | 5.41                    | 0.75                     | 3615.98                  | 1.75                    | 2.50                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 3                                 | 175.963           | 11401.887              | 33.683             | 5.453             | 3.116                  | 8.570                  |
| 9                                 | 14.135            | 27520.438              | 0.352              | 71.672            | 5.047                  | 76.720                 |
| 88                                | 2.783             | 2724.981               | 0.037              | 5.952             | 0.531                  | 6.484                  |
| 59                                | 2.898             | 2623.933               | 0.0                | 4.008             | 0.501                  | 4.509                  |
| 3                                 | 136.720           | 10635.238              | 15.917             | 5.154             | 2.209                  | 7.363                  |

DATE: 7/ 6/71

TEST ORGANIZATION: S W R I KELLY

ENGINE SUPPLIER: USAF, KELLY AFB

ENGINE DATA .....

CAL ID NUMBER: 17 ENGINE TYPE AND MODEL: J-79 SERIAL NUMBER: GF 4183128  
RATED THRUST: 10350.

ENGINE TOTAL TIME: 2149. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JP-4 FUEL W/C RATIO: 1.995

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 80.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.35 FINISH 29.35

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0167

RELATIVE HUMIDITY: 66.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 150.00, FLOW RATE, LITERS/MIN: 42.50

SAMPLE LINE TRANSPORT TIME, SEC: 0.50

NUMBER OF TESTS: 7

COMMENTS:

F/A CALCULATIONS BASED ON EXHAUST COMPOSITION FOR FIRST, FIFTH AND SEVENTH RUNS  
NO2 DETERMINED BY SUBTRACTION

| ELAPSED<br>TIME | TEST<br>MODE | POWER<br>THRUST,LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|-----------------|--------------|----------------------------------|--------------------------|------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| 0.0             | 7/ 0         | 230.00                           | 2                        | 4965.00                | -0.00                             | 1175.00                       | 45.90       | 0.007100                                     | -0.00                              | -0.00                                 |
| 17.00           | 3/ 7         | 10250.00                         | 99                       | 7665.00                | -0.00                             | 8850.00                       | 163.60      | 0.015200                                     | -0.00                              | -0.00                                 |
| 34.00           | 2/ 3         | 9620.00                          | 92                       | 7380.00                | -0.00                             | 8200.00                       | 157.80      | 0.014400                                     | -0.00                              | -0.00                                 |
| 44.00           | 1/ 2         | 6310.00                          | 60                       | 6880.00                | -0.00                             | 5300.00                       | 130.30      | 0.011300                                     | -0.00                              | -0.00                                 |
| 52.00           | 7/ 1         | 230.00                           | 2                        | 5000.00                | -0.00                             | 1170.00                       | 43.90       | 0.007400                                     | -0.00                              | -0.00                                 |
| 54.00           | 3/ 7         | 10200.00                         | 98                       | 7665.00                | -0.00                             | 8850.00                       | 163.60      | 0.015200                                     | -0.00                              | -0.00                                 |
| 62.30           | 7/ 3         | 245.00                           | 2                        | 5000.00                | -0.00                             | 1175.00                       | 41.80       | 0.007800                                     | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 2                                 | 654.00                              | -0.00                              | 385.00              | 1.43                          | 145.00               | 4.00                | 5.00                     | 9.00                     | -0.00     | -0.00 | -0.00        |
| 99                                | 1158.00                             | -0.00                              | 13.00               | 2.96                          | 0.0                  | 71.00               | 6.00                     | 77.00                    | -0.00     | -0.00 | -0.00        |
| 92                                | 1135.00                             | -0.00                              | 29.00               | 2.78                          | 1.00                 | 58.00               | 6.00                     | 64.00                    | -0.00     | -0.00 | -0.00        |
| 60                                | 924.00                              | -0.00                              | 43.00               | 2.37                          | 1.00                 | 32.00               | 5.00                     | 37.00                    | -0.00     | -0.00 | -0.00        |
| 2                                 | 652.00                              | -0.00                              | 352.00              | 1.50                          | 112.00               | 4.00                | 6.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |
| 98                                | 1160.00                             | -0.00                              | 13.00               | 2.88                          | 0.0                  | 74.00               | 8.00                     | 82.00                    | -0.00     | -0.00 | -0.00        |
| 2                                 | 654.00                              | -0.00                              | 351.00              | 1.58                          | 105.00               | 4.00                | 6.00                     | 10.00                    | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 2                                 | 51.86                              | 11.19                              | 1.11                                | 3026.69                             | 0.89                               | 1.99                                | 60.94                   | 13.14                   | 1.30                     | 3556.36                  | 1.04                    | 2.34                     |
| 99                                | 0.88                               | 0.0                                | 0.66                                | 3137.49                             | 7.87                               | 8.53                                | 7.76                    | 0.0                     | 5.88                     | 27766.82                 | 69.63                   | 75.51                    |
| 92                                | 2.08                               | 0.04                               | 0.71                                | 3135.49                             | 6.84                               | 7.55                                | 17.07                   | 0.34                    | 5.80                     | 25711.02                 | 56.08                   | 61.88                    |
| 60                                | 3.62                               | 0.05                               | 0.69                                | 3133.06                             | 4.42                               | 5.11                                | 19.17                   | 0.26                    | 3.66                     | 16605.19                 | 23.44                   | 27.10                    |
| 2                                 | 45.47                              | 8.29                               | 1.27                                | 3044.69                             | 0.85                               | 2.12                                | 53.20                   | 9.70                    | 1.49                     | 3562.28                  | 0.99                    | 2.48                     |
| 98                                | 0.90                               | 0.0                                | 0.91                                | 3137.46                             | 8.43                               | 9.34                                | 7.98                    | 0.0                     | 8.06                     | 27766.48                 | 74.58                   | 82.65                    |
| 2                                 | 43.13                              | 7.39                               | 1.21                                | 3050.82                             | 0.81                               | 2.02                                | 50.68                   | 8.68                    | 1.42                     | 3584.71                  | 0.95                    | 2.37                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
| 2                                 | 264.950           | 15462.453              | 57.150             | 4.522             | 5.652                  | 10.173                 |
| 99                                | 0.757             | 2708.958               | 0.0                | 6.793             | 0.574                  | 7.367                  |
| 92                                | 1.774             | 2672.663               | 0.035              | 5.829             | 0.603                  | 6.432                  |
| 60                                | 3.039             | 2631.568               | 0.040              | 3.714             | 0.580                  | 4.295                  |
| 2                                 | 231.320           | 15488.191              | 42.154             | 4.318             | 6.477                  | 10.794                 |
| 98                                | 0.782             | 2722.204               | 0.0                | 7.312             | 0.790                  | 8.103                  |
| 2                                 | 206.871           | 14631.484              | 35.443             | 3.872             | 5.809                  | 9.681                  |

DATE: 7/ 9/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA .....

CAL ID NUMBER: 97 ENGINE TYPE AND MODEL: TF30 P6C SERIAL NUMBER: 652017

RATED THRUST: 11500.

ENGINE TOTAL TIME: 1101. HRS

TIME SINCE HOT SECTION OVERHAUL: 851. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 460. HRS  
N2 COMPRESSOR OVERHAUL: 851. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 525. HRS  
N2 TURBINE OVERHAUL: 777. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 76.00 FINISH 76.00

ATMOSPHERIC PRESSURE: START 30.04 FINISH 30.04

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0167

RELATIVE HUMIDITY: 86.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 121.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |          | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2       |                                   |                               |             |                                              |                                    |                                       |
| -0.00         | 1/ 0         | -0.00                             | 0                        | -0.00                  | -0.00    | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 2/ 1         | 5961.00                           | 51                       | 7725.00                | 12840.00 | 3410.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.53                               | -0.00                                 |
| -0.00         | 3/ 2         | 7905.00                           | 68                       | 8500.00                | 13453.00 | 4550.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.73                               | -0.00                                 |
| -0.00         | 4/ 3         | 11160.00                          | 97                       | 9697.00                | 14417.00 | 6915.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.07                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 0                                 | -0.00                               | -0.00                              | 815.00              | 1.84                          | -0.00                | -0.00               | 3.00                     | 3.00                     | -0.00     | -0.00 | -0.00        |
| 51                                | 1483.00                             | 15.50                              | 20.00               | 2.42                          | -0.00                | -0.00               | 4.00                     | 4.00                     | -0.00     | -0.00 | -0.00        |
| 68                                | 1650.00                             | 21.40                              | 13.00               | 2.62                          | -0.00                | -0.00               | 8.00                     | 0.0                      | -0.00     | -0.00 | -0.00        |
| 97                                | 1990.00                             | 31.40                              | 11.00               | 2.88                          | -0.00                | -0.00               | 4.00                     | 4.00                     | -0.00     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 0                                 | 84.89                              | -0.00                              | 0.51                                | 3011.15                             | -0.00                              | 0.51                                | -0.00                   | 0.00                    | -0.00                    | -0.00                    | 0.00                    | -0.00                    |
| 51                                | 1.65                               | -0.00                              | 0.54                                | 3141.93                             | -0.00                              | 0.54                                | 5.64                    | -0.00                   | 1.85                     | 10713.47                 | -0.00                   | 1.85                     |
| 68                                | 0.99                               | -0.00                              | 1.00                                | 3142.96                             | -0.00                              | 0.0                                 | 4.52                    | -0.00                   | 4.56                     | 14300.48                 | -0.00                   | 0.0                      |
| 97                                | 0.76                               | -0.00                              | 0.46                                | 3143.32                             | -0.00                              | 0.46                                | 5.28                    | -0.00                   | 3.16                     | 21736.08                 | -0.00                   | 3.16                     |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

|    |       |          |        |        |       |       |
|----|-------|----------|--------|--------|-------|-------|
| 51 | 0.945 | 1797.344 | -0.000 | -0.000 | 0.311 | 0.311 |
| 68 | 0.571 | 1809.043 | -0.000 | -0.000 | 0.577 | 0.0   |
| 97 | 0.473 | 1947.677 | -0.000 | -0.000 | 0.283 | 0.283 |

DATE: 7/ 9/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 99 ENGINE TYPE AND MODEL: TF30 P6C SERIAL NUMBER: P652063

RATED THRUST: 11500.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 86.50

ATMOSPHERIC PRESSURE: START 30.08 FINISH 30.05

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0146

RELATIVE HUMIDITY: 55.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 126.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 6

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATIO T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | -0.00              | 0                        | -0.00            | -0.00                    | -0.00                   | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 1/ 1      | -0.00              | 0                        | -0.00            | -0.00                    | -0.00                   | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 1/ 1      | 680.00             | 5                        | 3190.00          | 8430.00                  | 700.00                  | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 5390.00            | 46                       | 7586.00          | 12826.00                 | 3120.00                 | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 3/ 2      | 7156.00            | 62                       | 8340.00          | 13365.00                 | 4130.00                 | -0.000000 | -0.00                               | 1.64                      | -0.00                        |
| -0.00      | 4/ 3      | 11081.00           | 96                       | 9998.00          | 14381.00                 | 6810.00                 | -0.000000 | -0.00                               | 2.05                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (CRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | -0.00                      | -0.00                     | 625.00        | 1.82                 | 255.00         | 5.00          | 4.00            | 9.00            | -0.00     | -0.00 | -0.00        |
| 0                        | -0.00                      | -0.00                     | 610.00        | 1.81                 | 220.00         | 10.00         | 4.00            | 5.00            | -0.00     | -0.00 | -0.00        |
| 5                        | 955.00                     | -0.00                     | 622.00        | 1.86                 | 225.00         | 4.90          | 4.00            | 4.90            | 5.90      | -0.00 | -0.00        |
| 46                       | 1465.00                    | 13.80                     | 62.00         | 2.50                 | 14.00          | 46.00         | 8.00            | 38.00           | 0.90      | -0.00 | -0.00        |
| 62                       | 1635.00                    | 18.80                     | 38.00         | 2.80                 | 9.00           | 65.00         | 9.00            | 60.00           | 0.90      | -0.00 | -0.00        |
| 96                       | 1990.00                    | 30.80                     | 32.00         | 3.35                 | 7.00           | 135.00        | 8.00            | 133.00          | 0.90      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 65.56                     | 15.32                     | 0.69                       | 2999.50                    | 0.86                      | 1.55                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 0                        | 64.49                     | 13.32                     | 0.69                       | 3006.65                    | 1.74                      | 0.87                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 5                        | 64.01                     | 13.26                     | 0.68                       | 3007.57                    | 0.83                      | 0.83                       | 44.81             | 9.28              | 0.47               | 2105.30            | 0.58              | 0.58               |
| 46                       | 4.95                      | 0.64                      | 1.05                       | 3135.00                    | 6.03                      | 4.98                       | 15.44             | 2.00              | 3.27               | 9781.18            | 18.81             | 15.54              |
| 62                       | 2.71                      | 0.37                      | 1.05                       | 3139.25                    | 7.62                      | 7.03                       | 11.20             | 1.52              | 4.36               | 12965.12           | 31.46             | 29.04              |
| 96                       | 1.91                      | 0.24                      | 0.78                       | 3140.87                    | 13.23                     | 13.04                      | 13.00             | 1.63              | 5.34               | 21389.30           | 90.11             | 88.77              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*  
\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

|    |        |          |        |       |       |       |
|----|--------|----------|--------|-------|-------|-------|
| 5  | 65.894 | 3096.024 | 13.652 | 0.853 | 0.696 | 0.853 |
| 46 | 2.864  | 1814.691 | 0.370  | 3.491 | 0.607 | 2.884 |
| 62 | 1.565  | 1811.783 | 0.212  | 4.397 | 0.609 | 4.059 |
| 96 | 1.174  | 1930.269 | 0.147  | 8.132 | 0.482 | 8.011 |

DATE: 6/30/71

TEST ORGANIZATION: SCOTT/MORFOLK

ENGINE SUPPLIER: PRATT AND WHITNEY

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 107 ENGINE TYPE AND MODEL: TF30 P6C SERIAL NUMBER: 651983

RATED THRUST: 11500.

ENGINE TOTAL TIME: 1160. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.00 FINISH 87.00

ATMOSPHERIC PRESSURE: START 30.02 FINISH 29.99

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0180

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 118.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 5

COMMENTS:

H/C CAL ESTIMATED  
PROBE J57 (EPA) MOD 2

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | N1       | N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------------|--------------------|------------------|----------|----|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 2/ 0      | 5668.00                  | 49                 | 7630.00          | 12856.00 |    | 3135.00                  | -0.00                   | -0.000000 | -0.00                               | 1.48                      | -0.00                        |
| -0.00      | 3/ 2      | 7443.00                  | 64                 | 8370.00          | 13398.00 |    | 4130.00                  | -0.00                   | -0.000000 | -0.00                               | 1.65                      | -0.00                        |
| -0.00      | 3/ 3      | 7443.00                  | 64                 | 8370.00          | 13398.00 |    | 4130.00                  | -0.00                   | -0.000000 | -0.00                               | 1.65                      | -0.00                        |
| -0.00      | 4/ 3      | 11457.00                 | 99                 | 9811.00          | 14557.00 |    | 6885.00                  | -0.00                   | -0.000000 | -0.00                               | 2.06                      | -0.00                        |
| -0.00      | 4/ 4      | 11430.00                 | 99                 | 9811.00          | 14580.00 |    | 6865.00                  | -0.00                   | -0.000000 | -0.00                               | 2.06                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 49                       | 1349.00                    | 14.00                     | 36.00         | 1.40                 | -0.00          | 10.00         | 4.00            | 14.00           | 1.00      | -0.00 | -0.00        |
| 64                       | 1499.00                    | 19.00                     | 27.00         | 2.20                 | -0.00          | 35.00         | 2.50            | 37.50           | 3.00      | -0.00 | -0.00        |
| 64                       | 1499.00                    | 19.00                     | 19.00         | 2.04                 | -0.00          | 35.00         | 2.50            | 37.50           | 2.00      | -0.00 | -0.00        |
| 99                       | 1865.00                    | 31.00                     | 18.00         | 3.52                 | -0.00          | 120.00        | 5.00            | 125.00          | 1.00      | -0.00 | -0.00        |
| 99                       | 2005.00                    | 31.00                     | 23.00         | 3.50                 | -0.00          | 120.00        | 6.00            | 126.00          | -0.00     | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 49                       | 5.13                      | -0.00                     | 0.94                       | 3136.46                    | 2.34                      | 3.28                       | 16.09             | -0.00             | 2.94               | 9832.80            | 7.34              | 10.28              |
| 64                       | 2.45                      | -0.00                     | 0.37                       | 3140.67                    | 5.22                      | 5.60                       | 10.13             | -0.00             | 1.54               | 12970.96           | 21.57             | 23.11              |
| 64                       | 1.86                      | -0.00                     | 0.40                       | 3141.60                    | 5.63                      | 6.04                       | 7.69              | -0.00             | 1.66               | 12974.79           | 23.27             | 24.93              |
| 99                       | 1.02                      | -0.00                     | 0.47                       | 3142.92                    | 11.20                     | 11.67                      | 7.04              | -0.00             | 3.21               | 21638.98           | 77.12             | 80.33              |
| 99                       | 1.31                      | -0.00                     | 0.56                       | 3142.46                    | 11.26                     | 11.83                      | 9.02              | -0.00             | 3.87               | 21572.98           | 77.32             | 81.19              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 49                       | 2.839          | 1734.791         | -0.000          | 1.295          | 0.518            | 1.814            |
| 64                       | 1.361          | 1742.706         | -0.000          | 2.898          | 0.207            | 3.105            |
| 64                       | 1.033          | 1743.220         | -0.000          | 3.127          | 0.223            | 3.350            |
| 99                       | 0.615          | 1888.712         | -0.000          | 6.731          | 0.280            | 7.012            |
| 99                       | 0.789          | 1887.400         | -0.000          | 6.765          | 0.338            | 7.103            |

DATE: 7/19/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 142 ENGINE TYPE AND MODEL: TF30 P6C SERIAL NUMBER: P659159  
RATED THRUST: 11500.  
ENGINE TOTAL TIME: 1103. HRS  
TIME SINCE HOT SECTION OVERHAUL: 0. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.50 FINISH 84.00  
ATMOSPHERIC PRESSURE: START 29.83 FINISH 29.83  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0166  
RELATIVE HUMIDITY: 67.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 108.90, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |          | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2       |                                   |                               |             |                                              |                                    |                                       |
| -0.00         | 1/ 0         | 640.00                            | 5                        | 3129.00                | 8267.00  | 665.00                            | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 2/ 1         | 5781.00                           | 50                       | 7703.00                | 12735.00 | 3260.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.51                               | -0.00                                 |
| -0.00         | 3/ 2         | 7618.00                           | 66                       | 8454.00                | 13266.00 | 4320.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.70                               | -0.00                                 |
| -0.00         | 4/ 3         | 11050.00                          | 96                       | 9825.00                | 14300.00 | 6895.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 5                                 | 912.00                              | -0.00                              | 302.00              | 0.85                          | -0.00                | 6.00                | 1.90                     | 4.00                     | 1.70      | -0.00 | -0.00        |
| 50                                | 1470.00                             | 14.90                              | 70.00               | 2.46                          | -0.00                | 35.00               | 8.00                     | 38.00                    | 0.50      | -0.00 | -0.00        |
| 66                                | 1635.00                             | 20.50                              | 46.00               | 2.78                          | -0.00                | 53.00               | 4.00                     | 61.00                    | 0.80      | -0.00 | -0.00        |
| 96                                | 1988.00                             | 31.50                              | 33.00               | 3.58                          | -0.00                | 130.00              | 4.00                     | 132.00                   | 0.50      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 5                                 | 68.67                              | -0.00                              | 0.71                                | 3036.63                             | 2.24                               | 1.49                                | 45.66                   | -0.00                   | 0.47                     | 2019.36                  | 1.49                    | 0.99                     |
| 50                                | 5.68                               | -0.00                              | 1.07                                | 3135.60                             | 4.66                               | 5.06                                | 18.51                   | -0.00                   | 3.48                     | 10222.05                 | 15.20                   | 16.51                    |
| 66                                | 3.31                               | -0.00                              | 0.47                                | 3139.33                             | 6.26                               | 7.20                                | 14.28                   | -0.00                   | 2.04                     | 13561.90                 | 27.03                   | 31.11                    |
| 96                                | 1.84                               | -0.00                              | 0.37                                | 3141.63                             | 11.93                              | 12.11                               | 12.71                   | -0.00                   | 2.53                     | 21661.52                 | 62.23                   | 83.50                    |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 5                                 | 71.348            | 3155.251               | -0.000             | 2.328             | 0.737                  | 1.552                  |
| 50                                | 3.202             | 1768.216               | -0.000             | 2.630             | 0.601                  | 2.855                  |
| 66                                | 1.875             | 1780.244               | -0.000             | 3.548             | 0.268                  | 4.084                  |
| 96                                | 1.150             | 1960.319               | -0.000             | 7.442             | 0.229                  | 7.556                  |

DATE: 7/23/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 154 ENGINE TYPE AND MODEL: TF30 P6C SERIAL NUMBER: P651947

RATED THRUST: 11500.

ENGINE TOTAL TIME: 976. HRS

TIME SINCE HOT SECTION OVERHAUL: 275. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 275. HRS  
N2 COMPRESSOR OVERHAUL: 275. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 275. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 75.00

ATMOSPHERIC PRESSURE: START 30.05 FINISH 30.05

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0114

RELATIVE HUMIDITY: 89.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 107.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 670.00             | 5                        | 3186.00          | 8369.00                  | 700.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 6046.00            | 52                       | 7790.00          | 12878.00                 | 3420.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 3/ 2      | 8024.00            | 69                       | 8575.00          | 13485.00                 | 4570.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 4/ 3      | 11160.00           | 97                       | 9720.00          | 14348.00                 | 6810.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 920.00                     | -0.00                     | 314.00        | 0.78                 | 139.00         | 2.00          | 1.90            | 3.90            | 2.60      | -0.00 | -0.00        |
| 52                       | 1470.00                    | 15.80                     | 66.00         | 2.39                 | 1.00           | 40.00         | 8.00            | 48.00           | 0.70      | -0.00 | -0.00        |
| 69                       | 1640.00                    | 21.40                     | 43.00         | 2.82                 | 0.49           | 62.00         | 5.00            | 67.00           | 1.10      | -0.00 | -0.00        |
| 97                       | 1945.00                    | 30.90                     | 34.00         | 3.42                 | 0.49           | 125.00        | 4.00            | 129.00          | 1.20      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 76.14                     | 19.30                     | 0.76                       | 2971.92                    | 0.80                      | 1.55                       | 53.30             | 13.51             | 0.53               | 2080.35            | 0.56              | 1.09               |
| 52                       | 5.51                      | 0.05                      | 1.10                       | 3135.74                    | 5.49                      | 6.58                       | 18.85             | 0.16              | 3.75               | 10724.21           | 18.76             | 22.52              |
| 69                       | 3.05                      | 0.02                      | 0.58                       | 3139.68                    | 7.22                      | 7.80                       | 13.92             | 0.09              | 2.66               | 14148.35           | 32.98             | 35.64              |
| 97                       | 1.99                      | 0.02                      | 0.38                       | 3141.36                    | 12.00                     | 12.39                      | 13.54             | 0.11              | 2.62               | 21392.64           | 81.74             | 84.35              |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 79.553         | 3104.994         | 20.169          | 0.832          | 0.791            | 1.623            |
| 52                       | 3.117          | 1773.770         | 0.027           | 3.103          | 0.621            | 3.724            |
| 69                       | 1.735          | 1788.179         | 0.011           | 4.110          | 0.331            | 4.441            |
| 97                       | 1.213          | 1916.903         | 0.010           | 7.324          | 0.234            | 7.559            |

DATE: 7/26/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 155 ENGINE TYPE AND MODEL: TF30-P8 SERIAL NUMBER: P664444

RATED THRUST: 12500.

ENGINE TOTAL TIME: 967. HRS

TIME SINCE HOT SECTION OVERHAUL: 967. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 967. HRS  
N2 COMPRESSOR OVERHAUL: 967. HRS  
COMBUSTOR CAN REPLACEMENT: 967. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 967. HRS  
N1 TURBINE OVERHAUL: 967. HRS  
N2 TURBINE OVERHAUL: 967. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 86.50 FINISH 86.50

ATMOSPHERIC PRESSURE: START 29.86 FINISH 29.86

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0174

RELATIVE HUMIDITY: 64.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 107.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 3

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGR F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|-----------|----------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | -0.00              | 0                        | -0.00            | -0.00                    | -0.00                   | -0.000000 | -0.00                            | -0.00                     | -0.00                        |
| -0.00      | 3/ 1      | 7953.00            | 63                       | 8465.00          | 4360.00                  | -0.00                   | -0.000000 | -0.00                            | 1.67                      | -0.00                        |
| -0.00      | 4/ 3      | 11237.00           | 89                       | 9640.00          | 6520.00                  | -0.00                   | -0.000000 | -0.00                            | 2.01                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | -0.00                      | -0.00                     | 360.00        | 0.79                 | 187.00         | 2.00          | 2.00            | 4.00            | 5.70      | -0.00 | -0.00        |
| 63                       | 1655.00                    | 19.60                     | 22.00         | 2.65                 | 1.00           | 85.00         | 3.00            | 88.00           | 0.50      | -0.00 | -0.00        |
| 89                       | 1915.00                    | 29.50                     | 9.00          | 3.15                 | 1.00           | 150.00        | 3.00            | 153.00          | 0.20      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 0                        | 85.29                     | 25.37                     | 0.78                       | 2940.89                    | 0.78                      | 1.56                       | -0.00             | -0.00             | -0.00              | -0.00              | -0.00             | -0.00              |
| 63                       | 1.66                      | 0.04                      | 0.37                       | 3141.80                    | 10.53                     | 10.91                      | 7.24              | 0.19              | 1.62               | 13698.24           | 45.93             | 47.55              |
| 89                       | 0.57                      | 0.04                      | 0.31                       | 3143.53                    | 15.65                     | 15.96                      | 3.73              | 0.24              | 2.04               | 20495.79           | 102.03            | 104.07             |

| POWER PERCENT RATED T.O.                              | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|-------------------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                |                  |                 |                |                  |                  |
| 63                                                    | 0.910          | 1722.399         | 0.024           | 5.775          | 0.204            | 5.979            |
| 89                                                    | 0.332          | 1823.956         | 0.021           | 9.080          | 0.182            | 9.261            |

DATE: 7/19/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 106 ENGINE TYPE AND MODEL: J52 - P8A SERIAL NUMBER: P661536  
RATED THRUST: 9300.  
ENGINE TOTAL TIME: 369. HRS  
TIME SINCE HOT SECTION OVERHAUL: 242. HRS  
TIME SINCE:  
N1 COMPRESSOR OVERHAUL: 369. HRS  
N2 COMPRESSOR OVERHAUL: 369. HRS  
COMBUSTOR CAN REPLACEMENT: 369. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 369. HRS  
N1 TURBINE OVERHAUL: 369. HRS  
N2 TURBINE OVERHAUL: 624. HRS  
FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 74.00 FINISH 74.00  
ATMOSPHERIC PRESSURE: START 29.74 FINISH 29.75  
INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0116  
RELATIVE HUMIDITY: 92.00 PERCENT  
SAMPLE LINE: TEMPERATURE, DEGREES C: 104.00, FLOW RATE, LITERS/MIN: -0.00  
SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |          | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2       |                                   |                               |             |                                              |                                    |                                       |
| -0.00         | 1/ 0         | -0.00                             | 0                        | -0.00                  | -0.00    | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 2/ 1         | 5920.00                           | 63                       | -0.00                  | 1106.00  | 4420.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.09                               | -0.00                                 |
| -0.00         | 3/ 2         | 7720.00                           | 83                       | -0.00                  | 11628.00 | 5915.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 4/ 3         | 8626.00                           | 92                       | -0.00                  | 11909.00 | 6800.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |          |       |              |
| 0                                 | -0.00                               | -0.00                              | 330.00              | 1.07                          | -0.00                | 8.00                | 1.90                     | 8.00                     | 2.10     | -0.00 | -0.00        |
| 63                                | 89.50                               | 32.00                              | 70.00               | 2.36                          | 9.00                 | 35.00               | 9.00                     | 39.00                    | 0.70     | -0.00 | -0.00        |
| 83                                | 1048.00                             | 42.60                              | 50.00               | 2.85                          | -0.00                | 57.00               | 3.00                     | 68.00                    | 0.60     | -0.00 | -0.00        |
| 92                                | 1140.00                             | 47.90                              | 26.00               | 3.07                          | 0.90                 | 80.00               | 3.00                     | 85.00                    | 0.50     | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 0                                 | 59.88                              | -0.00                              | 0.57                                | 3050.44                             | 2.38                               | 2.38                                | -0.00                   | 0.00                    | -0.00                    | -0.00                    | -0.00                   | -0.00                    |
| 63                                | 5.92                               | 0.44                               | 1.11                                | 3134.03                             | 4.86                               | 5.41                                | 26.15                   | 1.93                    | 4.91                     | 13852.43                 | 21.48                   | 23.93                    |
| 83                                | 3.50                               | -0.00                              | 0.35                                | 3139.02                             | 6.56                               | 7.83                                | 20.73                   | -0.00                   | 2.04                     | 18567.28                 | 18.82                   | 46.31                    |
| 92                                | 1.69                               | 0.03                               | 0.32                                | 3141.77                             | 8.56                               | 9.09                                | 11.52                   | 0.23                    | 2.18                     | 21364.04                 | 58.20                   | 61.84                    |

| POWER<br>PERCENT<br>RATED<br>T.O.                     | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-------------------------------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                                       |                   |                        |                    |                   |                        |                        |
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                   |                        |                    |                   |                        |                        |
| 63                                                    | 4.417             | 2339.937               | 0.325              | 3.628             | 0.829                  | 4.042                  |
| 83                                                    | 2.685             | 2405.088               | -0.000             | 5.029             | 0.265                  | 5.999                  |
| 92                                                    | 1.335             | 2476.703               | 0.026              | 6.747             | 0.253                  | 7.169                  |

DATE: 7/22/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 146 ENGINE TYPE AND MODEL: TF30-P8B SERIAL NUMBER: P664169  
RATED THRUST: 12500.

ENGINE TOTAL TIME: 991. HRS

TIME SINCE HOT SECTION OVERHAUL: 991. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 552. HRS  
N2 COMPRESSOR OVERHAUL: 261. HRS  
COMBUSTOR CAN REPLACEMENT: 562. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: 261. HRS  
N2 TURBINE OVERHAUL: 261. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 77.00 FINISH 77.00

ATMOSPHERIC PRESSURE: START 30.11 FINISH 30.11

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0120

RELATIVE HUMIDITY: 62.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 110.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 N2 | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | 650.00             | 5                        | 3040.00                | 8460.00                  | 700.00                  | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 6261.00            | 50                       | 7810.00                | 13160.00                 | 3440.00                 | -0.000000 | -0.00                               | 1.52                      | -0.00                        |
| -0.00      | 3/ 2      | 8313.00            | 66                       | 8535.00                | 13685.00                 | 4570.00                 | -0.000000 | -0.00                               | 1.70                      | -0.00                        |
| -0.00      | 4/ 3      | 11396.00           | 91                       | 9660.00                | 14505.00                 | 6680.00                 | -0.000007 | -0.00                               | 2.03                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 915.00                     | -0.00                     | 285.00        | 0.65                 | 158.00         | 4.00          | 3.00            | 7.00            | 3.10      | -0.00 | -0.00        |
| 50                       | 1505.00                    | 15.20                     | 23.00         | 2.30                 | 4.90           | 70.00         | 7.00            | 77.00           | 0.90      | -0.00 | -0.00        |
| 66                       | 1670.00                    | 20.70                     | 22.00         | 2.75                 | 1.00           | 113.00        | 8.00            | 121.00          | 1.10      | -0.00 | -0.00        |
| 91                       | 1930.00                    | 30.30                     | 19.00         | 3.25                 | 2.00           | 177.00        | 6.00            | 183.00          | 1.60      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 82.15                     | 26.08                     | 1.42                       | 2943.89                    | 1.89                      | 3.31                       | 57.51             | 19.26             | 0.99               | 2060.72            | 1.33              | 2.32               |
| 50                       | 2.00                      | 0.24                      | 1.00                       | 3140.72                    | 9.99                      | 10.99                      | 6.88              | 0.84              | 3.44               | 10804.06           | 34.37             | 37.81              |
| 66                       | 1.60                      | 0.04                      | 0.96                       | 3141.90                    | 13.50                     | 14.45                      | 7.31              | 0.19              | 4.37               | 14358.46           | 61.68             | 66.05              |
| 91                       | 1.17                      | 0.07                      | 0.61                       | 3142.49                    | 17.89                     | 18.50                      | 7.81              | 0.47              | 4.05               | 20991.96           | 119.52            | 123.57             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 88.471         | 3170.338         | 28.090          | 2.040          | 1.530            | 3.569            |
| 50                       | 1.098          | 1725.613         | 0.134           | 5.490          | 0.549            | 6.039            |
| 66                       | 0.879          | 1727.230         | 0.023           | 7.420          | 0.525            | 7.945            |
| 91                       | 0.685          | 1842.037         | 0.041           | 10.487         | 0.356            | 10.843           |

DATE: 7/13/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK MAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 101 ENGINE TYPE AND MODEL: TF30 P408 SERIAL NUMBER: 664241

RATED THRUST: 13400.

ENGINE TOTAL TIME: 0. HRS

TIME SINCE MOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 78.00 FINISH 78.00

ATMOSPHERIC PRESSURE: START 29.94 FINISH 29.94

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0157

RELATIVE HUMIDITY: 76.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 101.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM N1 | ENGINE SPEED RPM N2 | MEASURED FUEL FLOW LB/HR | GAS GFN AIR FLOW LB/SEC | CALC F/A  | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|---------------------|---------------------|--------------------------|-------------------------|-----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 17/ 0     | -0.00              | 0                        | 3227.00             | 8635.00             | 795.00                   | -0.00                   | -0.000000 | -0.00                               | -0.00                     | -0.00                        |
| -0.00      | 18/17     | 8023.00            | 59                       | 8242.00             | 13380.00            | 4500.00                  | -0.00                   | -0.000000 | -0.00                               | 1.82                      | -0.00                        |
| -0.00      | 19/18     | 10698.00           | 79                       | 9070.00             | 14000.00            | 6210.00                  | -0.00                   | -0.000000 | -0.00                               | 2.15                      | -0.00                        |
| -0.00      | 10/19     | 12417.00           | 92                       | 9705.00             | 14468.00            | 7590.00                  | -0.00                   | -0.000000 | -0.00                               | 2.37                      | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGR F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|-------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 960.00                  | -0.00                     | 485.00        | 1.20                 | 120.00         | 3.00          | 5.00            | 4.90            | 2.20      | -0.00 | -0.00        |
| 59                       | 1645.00                 | 24.10                     | 36.00         | 2.31                 | 4.00           | 48.00         | 8.00            | 49.00           | 0.40      | -0.00 | -0.00        |
| 79                       | 1855.00                 | 33.60                     | 22.00         | 2.80                 | 4.00           | 84.00         | 9.00            | 85.00           | 0.30      | -0.00 | -0.00        |
| 92                       | 2035.00                 | 40.00                     | 20.00         | 3.10                 | 4.00           | 130.00        | 8.00            | 132.00          | 0.40      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/1K LB/HR | MASS EMI HC LB/1K LB/HR | MASS EMI NO2 LB/1K LB/HR | MASS EMI CO2 LB/1K LB/HR | MASS EMI NO LB/1K LB/HR | MASS EMI NOX LB/1K LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                        | 77.00                     | 10.91                     | 1.30                       | 2993.60                    | 0.78                      | 1.28                       | 61.22                   | 8.67                    | 1.04                     | 2379.91                  | 0.62                    | 1.02                     |
| 59                       | 3.11                      | 0.20                      | 1.14                       | 3139.09                    | 6.82                      | 6.96                       | 14.01                   | 0.89                    | 5.11                     | 14125.89                 | 30.69                   | 31.32                    |
| 79                       | 1.57                      | 0.16                      | 1.06                       | 3141.61                    | 9.85                      | 9.97                       | 9.76                    | 1.02                    | 6.56                     | 19509.38                 | 61.19                   | 61.91                    |
| 92                       | 1.29                      | 0.15                      | 0.85                       | 3142.09                    | 13.77                     | 13.99                      | 9.79                    | 1.12                    | 6.43                     | 23848.49                 | 104.55                  | 106.16                   |

| POWER PERCENT RATED T.O.                              | CO LB/1K*TH-HR | CO 2 LB/1K*TH-HR | THC LB/1K*TH-HR | NO LB/1K*TH-HR | NO 2 LB/1K*TH-HR | NO X LB/1K*TH-HR |
|-------------------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                |                  |                 |                |                  |                  |
| 59                                                    | 1.746          | 1760.675         | 0.111           | 3.825          | 0.637            | 3.904            |
| 79                                                    | 0.912          | 1823.647         | 0.095           | 5.719          | 0.613            | 5.787            |
| 92                                                    | 0.789          | 1920.632         | 0.090           | 8.420          | 0.518            | 8.549            |

DATE: 7/14/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 102 ENGINE TYPE AND MODEL: TF30 P408 SERIAL NUMBER: 664371

RATED THRUST: 13400.

ENGINE TOTAL TIME: 1021. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 85.50 FINISH 85.00

ATMOSPHERIC PRESSURE: START 29.69 FINISH 29.69

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0173

RELATIVE HUMIDITY: 68.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 98.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS<br>OR<br>SHP | POWER<br>PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 N2 | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|------------|-----------|--------------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| -0.00      | 1/ 0      | -0.00                    | 0                                 | 3228.00 8666.00                 | 770.00                            | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00      | 2/ 1      | 8.53                     | 0                                 | 8269.00 13455.00                | 4375.00                           | -0.00                         | -0.000000   | -0.00                                        | 1.80                               | -0.00                                 |
| -0.00      | 3/ 2      | 1065.60                  | 7                                 | 9059.00 14077.00                | 5960.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.11                               | -0.00                                 |
| -0.00      | 4/ 3      | 12366.00                 | 92                                | 9647.00 14540.00                | 7230.00                           | -0.00                         | -0.000000   | -0.00                                        | 2.33                               | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                 | 980.00                              | -0.00                              | 540.00              | 1.44                          | 260.00               | 11.00               | 1.90                     | 8.00                     | 5.20      | -0.00 | -0.00        |
| 0                                 | 1650.00                             | 23.10                              | 29.00               | 2.50                          | 1.00                 | 50.00               | 5.00                     | 54.00                    | 1.20      | -0.00 | -0.00        |
| 7                                 | 1850.00                             | 32.20                              | 21.00               | 2.83                          | 1.00                 | 90.00               | 4.00                     | 91.00                    | 1.20      | -0.00 | -0.00        |
| 92                                | 2020.00                             | 38.50                              | 18.00               | 3.10                          | 1.00                 | 135.00              | 3.00                     | 135.00                   | 1.10      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| 0                                 | 71.10                              | 19.61                              | 0.41                                | 2979.03                             | 2.38                               | 1.73                                | 54.75                   | 15.10                   | 0.32                     | 2293.85                  | 1.83                    | 1.33                     |
| 0                                 | 2.32                               | 0.05                               | 0.66                                | 3140.76                             | 6.57                               | 7.09                                | 10.14                   | 0.20                    | 2.87                     | 13740.80                 | 28.73                   | 31.03                    |
| 7                                 | 1.48                               | 0.04                               | 0.46                                | 3142.08                             | 10.45                              | 10.56                               | 8.84                    | 0.24                    | 2.77                     | 18726.79                 | 62.26                   | 62.95                    |
| 92                                | 1.16                               | 0.04                               | 0.32                                | 3142.60                             | 14.31                              | 14.31                               | 8.40                    | 0.27                    | 2.30                     | 22720.98                 | 103.44                  | 103.44                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|

\*\*\*HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE\*\*\*

|    |          |             |        |          |         |          |
|----|----------|-------------|--------|----------|---------|----------|
| 0  | 1189.277 | 1610879.000 | 23.487 | 3368.025 | 336.802 | 3637.465 |
| 7  | 8.300    | 17573.949   | 0.226  | 58.426   | 2.597   | 59.075   |
| 92 | 0.679    | 1837.375    | 0.022  | 8.365    | 0.186   | 8.365    |

DATE: 7/16/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA .....

CAL ID NUMBER: 104 ENGINE TYPE AND MODEL: TF30 P408 SERIAL NUMBER: 671490  
RATED THRUST: 13400.

ENGINE TOTAL TIME: 626. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL W/C RATIO: 1.970

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 80.50 FINISH 82.00

ATMOSPHERIC PRESSURE: START 29.89 FINISH 29.89

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0149

RELATIVE HUMIDITY: 65.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 98.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 2

COMMENTS:

H/C CAL ESTIMATED

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OR<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM |          | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------|----------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
|               |              |                                   |                          | N1                     | N2       |                                   |                               |             |                                              |                                    |                                       |
| -0.00         | 1/ 0         | 780.00                            | 5                        | 3272.00                | 8713.00  | 780.00                            | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 4/ 1         | 12060.00                          | 89                       | 9721.00                | 14524.00 | 7420.00                           | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(DRY)<br>PPMV | CO<br>2<br>(DRY)<br>PERCENT V | THC<br>(DRY)<br>PPMV | NO<br>(DRY)<br>PPMV | NO<br>2<br>(DRY)<br>PPMV | NO<br>X<br>(DRY)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
|                                   |                                     |                                    |                     |                               |                      |                     |                          |                          |           |       |              |
| 5                                 | -0.00                               | -0.00                              | 535.00              | 1.58                          | 231.00               | 10.00               | 1.90                     | 10.00                    | 0.50      | -0.00 | -0.00        |
| 89                                | -0.00                               | -0.00                              | 22.00               | 3.35                          | 3.00                 | 158.00              | 3.00                     | 166.00                   | 8.50      | -0.00 | -0.00        |

| POWER<br>PERCENT<br>RATED<br>T.O. | MASS EMI<br>CO<br>LB/1K<br>LB FUEL | MASS EMI<br>HC<br>LB/1K<br>LB FUEL | MASS EMI<br>NO2<br>LB/1K<br>LB FUEL | MASS EMI<br>CO2<br>LB/1K<br>LB FUEL | MASS EMI<br>NO<br>LB/1K<br>LB FUEL | MASS EMI<br>NOX<br>LB/1K<br>LB FUEL | MASS EMI<br>CO<br>LB/HR | MASS EMI<br>HC<br>LB/HR | MASS EMI<br>NO2<br>LB/HR | MASS EMI<br>CO2<br>LB/HR | MASS EMI<br>NO<br>LB/HR | MASS EMI<br>NOX<br>LB/HR |
|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------------|--------------------------|
|                                   |                                    |                                    |                                     |                                     |                                    |                                     |                         |                         |                          |                          |                         |                          |
| 5                                 | 64.63                              | 15.98                              | 0.38                                | 2999.12                             | 1.98                               | 1.98                                | 50.41                   | 12.47                   | 0.29                     | 2339.32                  | 1.55                    | 1.55                     |
| 89                                | 1.31                               | 0.10                               | 0.29                                | 3142.18                             | 15.49                              | 16.28                               | 9.74                    | 0.76                    | 2.18                     | 23314.96                 | 114.96                  | 120.78                   |

| POWER<br>PERCENT<br>RATED<br>T.O. | CO<br>LB/1K#TH-HR | CO<br>2<br>LB/1K#TH-HR | THC<br>LB/1K#TH-HR | NO<br>LB/1K#TH-HR | NO<br>2<br>LB/1K#TH-HR | NO<br>X<br>LB/1K#TH-HR |
|-----------------------------------|-------------------|------------------------|--------------------|-------------------|------------------------|------------------------|
|                                   |                   |                        |                    |                   |                        |                        |
| 5                                 | 64.633            | 2999.124               | 15.983             | 1.984             | 0.377                  | 1.984                  |
| 89                                | 0.808             | 1933.247               | 0.063              | 9.532             | 0.181                  | 10.015                 |

DATE: 7/20/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK HAS

ENGINE DATA \*\*\*\*\*

CAL ID NUMBER: 143 ENGINE TYPE AND MODEL: TF30 P408

SERIAL NUMBER: P671484

RATED THRUST: 13400.

ENGINE TOTAL TIME: 390. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 79.00 FINISH 80.00

ATMOSPHERIC PRESSURE: START 29.82 FINISH 29.83

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0160

RELATIVE HUMIDITY: 70.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 110.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | POWER THRUST, LBS OR SHP | PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGR F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGR F |
|------------|-----------|--------------------------|--------------------|------------------|--------------------------|-------------------------|----------|----------------------------------|---------------------------|---------------------------|
|            |           |                          |                    | N1               | N2                       |                         |          |                                  |                           |                           |
| -0.00      | 1/ 0      | 795.00                   | 5                  | 3252.00          | 8688.00                  | 785.00                  | -0.00    | -0.000000                        | -0.00                     | -0.00                     |
| -0.00      | 2/ 1      | 7827.00                  | 58                 | 8202.00          | 13365.00                 | 4375.00                 | -0.00    | -0.000000                        | -0.00                     | -0.00                     |
| -0.00      | 3/ 2      | 10509.00                 | 78                 | 9087.00          | 14027.00                 | 6000.00                 | -0.00    | -0.000000                        | -0.00                     | -0.00                     |
| -0.00      | 4/ 3      | 12264.00                 | 91                 | 9670.00          | 14497.00                 | 7330.00                 | -0.00    | -0.000000                        | -0.00                     | -0.00                     |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 5                        | 974.00                     | -0.00                     | 530.00        | 1.55                 | 23.30          | 11.00         | 3.00            | 10.00           | 10.10     | -0.00 | -0.00        |
| 58                       | 1625.00                    | 23.20                     | 42.00         | 2.93                 | 1.00           | 54.00         | 8.00            | 57.00           | 0.40      | -0.00 | -0.00        |
| 78                       | 1840.00                    | 32.80                     | 26.00         | 3.10                 | 0.90           | 108.00        | 7.00            | 102.00          | 0.50      | -0.00 | -0.00        |
| 91                       | 2015.00                    | 39.20                     | 25.00         | 3.20                 | 1.00           | 139.00        | 4.00            | 143.00          | 0.50      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NO LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NO LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| 5                        | 66.07                     | 1.66                      | 0.61                       | 3036.14                    | 2.25                      | 2.05                       | 51.87             | 1.31              | 0.48               | 2383.37            | 1.77              | 1.61               |
| 58                       | 2.86                      | 0.04                      | 0.90                       | 3139.92                    | 6.05                      | 6.39                       | 12.53             | 0.17              | 3.92               | 13737.13           | 26.47             | 27.94              |
| 78                       | 1.68                      | 0.03                      | 0.74                       | 3141.80                    | 11.44                     | 10.81                      | 10.06             | 0.20              | 4.45               | 18850.79           | 68.66             | 64.84              |
| 91                       | 1.56                      | 0.04                      | 0.41                       | 3141.97                    | 14.27                     | 14.68                      | 11.45             | 0.26              | 3.01               | 23030.64           | 104.58            | 107.59             |

| POWER PERCENT RATED T.O. | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|--------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| 5                        | 65.243         | 2997.954         | 1.643           | 2.224          | 0.607            | 2.022            |
| 58                       | 1.601          | 1755.095         | 0.022           | 3.381          | 0.501            | 3.569            |
| 78                       | 0.958          | 1793.776         | 0.019           | 6.533          | 0.423            | 6.170            |
| 91                       | 0.934          | 1877.906         | 0.021           | 8.527          | 0.245            | 8.773            |

DATE: 7/27/71

TEST ORGANIZATION: SCOTT/NORFOLK

ENGINE SUPPLIER: NORFOLK NAS

ENGINE DATA \*\*\*\*\*

CAL TO NUMBER: 156 ENGINE TYPE AND MODEL: TF30 P408 SERIAL NUMBER: P664193

RATED THRUST: 13400.

ENGINE TOTAL TIME: 508. HRS

TIME SINCE HOT SECTION OVERHAUL: 0. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: 0. HRS  
N2 COMPRESSOR OVERHAUL: 0. HRS  
COMBUSTOR CAN REPLACEMENT: 0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: 0. HRS  
N1 TURBINE OVERHAUL: 0. HRS  
N2 TURBINE OVERHAUL: 0. HRS

FUEL: JP-5 FUEL H/C RATIO: 1.970

OPERATIONAL DATA \*\*\*\*\*

INLET AIR TEMPERATURE, DEGREES F: START 83.00 FINISH 83.00

ATMOSPHERIC PRESSURE: START 29.93 FINISH 29.93

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0169

RELATIVE HUMIDITY: 69.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 126.00, FLOW RATE, LITERS/MIN: -0.00

SAMPLE LINE TRANSPORT TIME, SEC: -0.00

NUMBER OF TESTS: 4

COMMENTS:

H/C CAL ESTIMATED

| CLOCK TIME | TEST MODE | THRUST, LBS OR SHP | POWER PERCENT RATED T.O. | ENGINE SPEED RPM | MEASURED FUEL FLOW LB/HR | GAS GEN AIR FLOW LB/SEC | CALC F/A | COMPRESSOR DISCHARGE TEMP DEGREES F | ENGINE PRESSURE RATIO EPR | TURBINE INLET TEMP DEGREES F |
|------------|-----------|--------------------|--------------------------|------------------|--------------------------|-------------------------|----------|-------------------------------------|---------------------------|------------------------------|
| -0.00      | 1/ 0      | -0.00              | 0                        | 3238.00          | 8565.00                  | 775.00                  | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 2/ 1      | 7714.00            | 57                       | 8243.00          | 13401.00                 | 4310.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 3/ 2      | 10348.00           | 77                       | 9082.00          | 14065.00                 | 5970.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |
| -0.00      | 4/ 3      | 12090.00           | 90                       | 9687.00          | 14543.00                 | 7210.00                 | -0.00    | -0.000000                           | -0.00                     | -0.00                        |

| POWER PERCENT RATED T.O. | EXHAUST GAS TEMP DEGREES F | EXHAUST GAS PRESSURE PSIA | CO (DRY) PPMV | CO 2 (DRY) PERCENT V | THC (DRY) PPMV | NO (DRY) PPMV | NO 2 (DRY) PPMV | NO X (DRY) PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|--------------------------|----------------------------|---------------------------|---------------|----------------------|----------------|---------------|-----------------|-----------------|-----------|-------|--------------|
| 0                        | 984.00                     | -0.00                     | 540.00        | 1.59                 | 265.00         | 12.00         | 2.00            | 14.00           | 0.80      | -0.00 | -0.00        |
| 57                       | 1655.00                    | 22.50                     | 42.00         | 2.78                 | 1.00           | 58.00         | 5.00            | 63.00           | 0.10      | -0.00 | -0.00        |
| 77                       | 1883.00                    | 31.60                     | 28.00         | 3.17                 | 1.00           | 102.00        | 3.00            | 105.00          | 0.04      | -0.00 | -0.00        |
| 90                       | 2055.00                    | 38.10                     | 24.00         | 3.50                 | 0.90           | 160.00        | 4.00            | 164.00          | 0.30      | -0.00 | -0.00        |

| POWER PERCENT RATED T.O. | MASS EMI CO LB/1K LB FUEL | MASS EMI HC LB/1K LB FUEL | MASS EMI NO2 LB/1K LB FUEL | MASS EMI CO2 LB/1K LB FUEL | MASS EMI NH3 LB/1K LB FUEL | MASS EMI NOX LB/1K LB FUEL | MASS EMI CO LB/HR | MASS EMI HC LB/HR | MASS EMI NO2 LB/HR | MASS EMI CO2 LB/HR | MASS EMI NH3 LB/HR | MASS EMI NOX LB/HR |
|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| 0                        | 64.69                     | 18.18                     | 0.39                       | 2992.99                    | 2.36                       | 2.75                       | 50.14             | 14.09             | 0.31               | 2314.57            | 1.83               | 2.14               |
| 57                       | 3.02                      | 0.04                      | 0.59                       | 3139.67                    | 6.85                       | 7.44                       | 13.01             | 0.18              | 2.54               | 13531.96           | 29.51              | 32.06              |
| 77                       | 1.77                      | 0.04                      | 0.31                       | 3141.65                    | 10.57                      | 10.88                      | 19.54             | 0.22              | 1.86               | 18755.65           | 63.09              | 64.94              |
| 90                       | 1.37                      | 0.03                      | 0.38                       | 3142.29                    | 15.02                      | 15.39                      | 9.89              | 0.21              | 2.71               | 22655.90           | 108.27             | 110.98             |

| POWER PERCENT RATED T.O.                              | CO LB/1K#TH-HR | CO 2 LB/1K#TH-HR | THC LB/1K#TH-HR | NO LB/1K#TH-HR | NO 2 LB/1K#TH-HR | NO X LB/1K#TH-HR |
|-------------------------------------------------------|----------------|------------------|-----------------|----------------|------------------|------------------|
| ***HORSEPOWER-HR OR THRUST-HR BASIS NOT CALCULABLE*** |                |                  |                 |                |                  |                  |
| 57                                                    | 1.687          | 1754.208         | 0.023           | 3.826          | 0.330            | 4.156            |
| 77                                                    | 1.019          | 1812.490         | 0.021           | 6.097          | 0.179            | 6.276            |
| 90                                                    | 0.818          | 1873.937         | 0.018           | 8.955          | 0.224            | 9.179            |

DATE: 7/19/71

TEST ORGANIZATION: UNITED/EPA

ENGINE SUPPLIER: UNITED AIRLINES

ENGINE DATA .....

CAL ID NUMBER: 135 ENGINE TYPE AND MODEL: JT4A -11

SERIAL NUMBER: 611170

RATED THRUST: 17500.

ENGINE TOTAL TIME: 16271. HRS

TIME SINCE HOT SECTION OVERHAUL: 16271. HRS

TIME SINCE:

N1 COMPRESSOR OVERHAUL: -0. HRS  
N2 COMPRESSOR OVERHAUL: -0. HRS  
COMBUSTOR CAN REPLACEMENT: -0. HRS  
FIRST STAGE NOZZLE GUIDE VANE OVERHAUL: -0. HRS  
N1 TURBINE OVERHAUL: -0. HRS  
N2 TURBINE OVERHAUL: -0. HRS

FUEL: JET - A

FUEL W/C RATIO: 1.920

OPERATIONAL DATA .....

INLET AIR TEMPERATURE, DEGREES F: START 59.00 FINISH 57.20

ATMOSPHERIC PRESSURE: START 29.93 FINISH 29.95

INLET AIR HUMIDITY, LBS H2O/LB AIR: 0.0086

RELATIVE HUMIDITY: 60.00 PERCENT

SAMPLE LINE: TEMPERATURE, DEGREES C: 160.00, FLOW RATE, LITERS/MIN: 5.00

SAMPLE LINE TRANSPORT TIME, SEC: 5.00

NUMBER OF TESTS: 5

COMMENTS:

NO ENGINE OPERATIONAL DATA  
C1-2 ADDITIVE USED ON RUNS 1 AND 2  
HIGH PROBE BUFFET AT 5000 # THRUST, CRACKED SUPPORT ROLLED  
PROBE SUPPORT FAILED ON LAST RUN

| CLOCK<br>TIME | TEST<br>MODE | POWER<br>THRUST, LBS<br>OP<br>SHP | PERCENT<br>RATED<br>T.O. | ENGINE<br>SPEED<br>RPM<br>N1 | N2    | MEASURED<br>FUEL<br>FLOW<br>LB/HR | GAS GEN<br>AIR FLOW<br>LB/SEC | CALC<br>F/A | COMPRESSOR<br>DISCHARGE<br>TEMP<br>DEGREES F | ENGINE<br>PRESSURE<br>RATIO<br>EPR | TURBINE<br>INLET<br>TEMP<br>DEGREES F |
|---------------|--------------|-----------------------------------|--------------------------|------------------------------|-------|-----------------------------------|-------------------------------|-------------|----------------------------------------------|------------------------------------|---------------------------------------|
| -0.00         | 4/ 0         | -0.00                             | 0                        | -0.00                        | -0.00 | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 5/ 4         | -0.00                             | 0                        | -0.00                        | -0.00 | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 5/ 5         | -0.00                             | 0                        | -0.00                        | -0.00 | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 4/ 5         | -0.00                             | 0                        | -0.00                        | -0.00 | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |
| -0.00         | 1/ 4         | -0.00                             | 0                        | -0.00                        | -0.00 | -0.00                             | -0.00                         | -0.000000   | -0.00                                        | -0.00                              | -0.00                                 |

| POWER<br>PERCENT<br>RATED<br>T.O. | EXHAUST<br>GAS<br>TEMP<br>DEGREES F | EXHAUST<br>GAS<br>PRESSURE<br>PSIA | CO<br>(WET)<br>PPMV | CO<br>2<br>(WET)<br>PERCENT V | THC<br>(WET)<br>PPMV | NO<br>(WET)<br>PPMV | NO<br>2<br>(WET)<br>PPMV | NO<br>X<br>(WET)<br>PPMV | ALDEHYDES | SMOKE | PARTICULATES |
|-----------------------------------|-------------------------------------|------------------------------------|---------------------|-------------------------------|----------------------|---------------------|--------------------------|--------------------------|-----------|-------|--------------|
| 0                                 | -0.00                               | -0.00                              | 660.00              | 1.35                          | 1200.00              | 8.60                | -0.00                    | 8.00                     | -0.00     | -0.00 | -0.00        |
| 0                                 | -0.00                               | -0.00                              | 100.00              | 2.00                          | 30.00                | 35.60               | -0.00                    | 36.00                    | -0.00     | -0.00 | -0.00        |
| 0                                 | -0.00                               | -0.00                              | 90.00               | 1.95                          | 9.00                 | 44.00               | -0.00                    | 46.00                    | -0.00     | -0.00 | -0.00        |
| 0                                 | -0.00                               | -0.00                              | 560.00              | 1.10                          | 1200.00              | 6.00                | -0.00                    | 9.00                     | -0.00     | -0.00 | -0.00        |
| 0                                 | -0.00                               | -0.00                              | 70.00               | 2.25                          | 4.50                 | 56.00               | -0.00                    | 60.00                    | -0.00     | -0.00 | -0.00        |

**TABLE V**

**TURBINE/TURBOPROP ENGINES  
(WEIGHTED PROCESSING)**

**CONTENTS:**

|                    |                        |
|--------------------|------------------------|
| <b>V-2 TO V-14</b> | <b>MODEL SUMMARIES</b> |
|--------------------|------------------------|

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 5.013                     | 636.717               | 19.00                   | 0.794              | 201.63               | 7.854                 | 71.34           | 0.01112          |
|                                   | STD DEV | 2.968                     | 15.761                | 0.0                     | 0.470              | 4.98                 | 4.590                 | 0.13            | 0.00659          |
| TAKEOFF                           | MEAN    | 2.150                     | 2079.317              | 0.50                    | 0.018              | 17.33                | 1.040                 | 31.29           | 0.00057          |
|                                   | STD DEV | 1.285                     | 77.480                | 0.0                     | 0.011              | 0.65                 | 0.627                 | 0.03            | 0.00034          |
| CLIMBOUT                          | MEAN    | 3.009                     | 1908.447              | 2.50                    | 0.125              | 79.52                | 1.579                 | 140.81          | 0.00089          |
|                                   | STD DEV | 0.791                     | 25.675                | 0.0                     | 0.033              | 1.08                 | 0.421                 | 0.18            | 0.00023          |
| APPROACH                          | MEAN    | 3.668                     | 1052.900              | 4.50                    | 0.275              | 78.97                | 3.482                 | 84.49           | 0.00326          |
|                                   | STD DEV | 0.841                     | 23.937                | 0.0                     | 0.063              | 1.79                 | 0.787                 | 0.14            | 0.00075          |
| TAXI-IDLE                         | MEAN    | 5.013                     | 636.717               | 7.00                    | 0.292              | 74.28                | 7.854                 | 26.28           | 0.01112          |
|                                   | STD DEV | 2.968                     | 15.761                | 0.0                     | 0.173              | 1.84                 | 4.590                 | 0.0             | 0.00659          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 1.504              | 451.72               |                       | 354.22          |                  |
|                                   |         |                           |                       | STD DEV:                | 0.675              | 7.42                 |                       | 0.0             |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 3.329              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 1.488              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.247              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 1.907              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.477              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.285              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 1.462                     | 636.717               | 19.00                   | 0.232              | 201.63               | 2.298                 | 71.34           | 0.00325          |
|                                   | STD DEV | 1.315                     | 15.761                | 0.0                     | 0.208              | 4.98                 | 2.056                 | 0.13            | 0.00292          |
| TAKEOFF                           | MEAN    | 0.430                     | 2079.317              | 0.50                    | 0.004              | 17.33                | 0.207                 | 31.29           | 0.00011          |
|                                   | STD DEV | 0.911                     | 77.480                | 0.0                     | 0.008              | 0.65                 | 0.438                 | 0.03            | 0.00024          |
| CLIMBOUT                          | MEAN    | 0.476                     | 1908.447              | 2.50                    | 0.020              | 79.52                | 0.250                 | 140.81          | 0.00014          |
|                                   | STD DEV | 0.976                     | 25.675                | 0.0                     | 0.041              | 1.08                 | 0.512                 | 0.18            | 0.00029          |
| APPROACH                          | MEAN    | 0.517                     | 1052.900              | 4.50                    | 0.039              | 78.97                | 0.491                 | 84.49           | 0.00046          |
|                                   | STD DEV | 1.004                     | 23.937                | 0.0                     | 0.075              | 1.79                 | 0.952                 | 0.14            | 0.00089          |
| TAXI-IDLE                         | MEAN    | 1.462                     | 636.717               | 7.00                    | 0.085              | 74.28                | 2.298                 | 26.28           | 0.00325          |
|                                   | STD DEV | 1.315                     | 15.761                | 0.0                     | 0.077              | 1.84                 | 2.056                 | 0.0             | 0.00292          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.379              | 451.72               |                       | 354.22          |                  |
|                                   |         |                           |                       | STD DEV:                | 0.359              | 7.42                 |                       | 0.0             |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 0.842              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.799              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 1.070              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 1.014              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.955              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 2.021              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX/<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 3.343                     | 636.717               | 19.00                   | 0.529               | 201.63               | 5.245                 | 71.34           | 0.00742          |
|                                   | STD DEV | 0.357                     | 15.761                | 0.0                     | 0.056               | 4.98                 | 0.488                 | 0.13            | 0.00079          |
| TAKEOFF                           | MEAN    | 22.878                    | 2079.317              | 0.50                    | 0.191               | 17.33                | 10.984                | 31.29           | 0.00609          |
|                                   | STD DEV | 3.566                     | 77.480                | 0.0                     | 0.030               | 0.65                 | 1.501                 | 0.03            | 0.00095          |
| CLIMBOUT                          | MEAN    | 21.212                    | 1908.447              | 2.50                    | 0.884               | 79.52                | 11.111                | 140.81          | 0.00628          |
|                                   | STD DEV | 2.314                     | 25.675                | 0.0                     | 0.096               | 1.08                 | 1.154                 | 0.18            | 0.00068          |
| APPROACH                          | MEAN    | 7.776                     | 1052.900              | 4.50                    | 0.583               | 78.97                | 7.382                 | 84.49           | 0.00690          |
|                                   | STD DEV | 0.913                     | 23.937                | 0.0                     | 0.068               | 1.79                 | 0.812                 | 0.14            | 0.00081          |
| TAXI-IDLE                         | MEAN    | 3.343                     | 636.717               | 7.00                    | 0.195               | 74.28                | 5.245                 | 26.28           | 0.00742          |
|                                   | STD DEV | 0.357                     | 15.761                | 0.0                     | 0.021               | 1.84                 | 0.488                 | 0.0             | 0.00079          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 2.382               | 451.72               |                       | 354.22          |                  |
|                                   |         |                           |                       | STD DEV:                | 0.232               | 7.42                 |                       | 0.0             |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 5.269               |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.454               |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.725               |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.654               |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 50.773              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 7.914               |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 4.896                     | 677.688               | 19.00                   | 0.775              | 214.60               | 7.221                 | 87.23           | 0.00889          |
|                                   | STD DEV | 0.855                     | 67.967                | 0.0                     | 0.135              | 21.52                | 0.992                 | 0.13            | 0.00155          |
| TAKEOFF                           | MEAN    | 3.765                     | 2392.661              | 0.50                    | 0.031              | 19.94                | 1.565                 | 38.26           | 0.00082          |
|                                   | STD DEV | 1.293                     | 124.766               | 0.0                     | 0.011              | 1.04                 | 0.491                 | 0.05            | 0.00028          |
| CLIMBOUT                          | MEAN    | 3.404                     | 2188.467              | 2.50                    | 0.142              | 91.19                | 1.549                 | 172.16          | 0.00082          |
|                                   | STD DEV | 0.801                     | 95.255                | 0.0                     | 0.033              | 3.97                 | 0.317                 | 0.08            | 0.00019          |
| APPROACH                          | MEAN    | 3.489                     | 1145.895              | 4.50                    | 0.262              | 85.94                | 3.044                 | 103.30          | 0.00253          |
|                                   | STD DEV | 0.848                     | 19.792                | 0.0                     | 0.064              | 1.48                 | 0.731                 | 0.15            | 0.00062          |
| TAXI-IDLE                         | MEAN    | 4.896                     | 677.688               | 7.00                    | 0.286              | 79.06                | 7.221                 | 32.14           | 0.00889          |
|                                   | STD DEV | 0.855                     | 67.967                | 0.0                     | 0.050              | 7.93                 | 0.992                 | 0.0             | 0.00155          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 1.496              | 490.73               |                       | 433.08          |                  |
|                                   |         |                           |                       | STD DEV:                | 0.214              | 30.21                |                       | 0.43            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 3.045              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.372              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 3.454              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.494              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.683              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.235              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 1.158                     | 677.688               | 19.00                   | 0.183              | 214.60               | 1.687                 | 87.23           | 0.00210          |
|                                   | STD DEV | 1.424                     | 67.967                | 0.0                     | 0.225              | 21.52                | 2.037                 | 0.13            | 0.00258          |
| TAKEOFF                           | MEAN    | 0.440                     | 2392.661              | 0.50                    | 0.004              | 19.94                | 0.179                 | 38.26           | 0.00010          |
|                                   | STD DEV | 0.666                     | 124.766               | 0.0                     | 0.006              | 1.04                 | 0.272                 | 0.05            | 0.00015          |
| CLIMBOUT                          | MEAN    | 0.399                     | 2188.467              | 2.50                    | 0.017              | 91.19                | 0.179                 | 172.16          | 0.00010          |
|                                   | STD DEV | 0.590                     | 95.255                | 0.0                     | 0.025              | 3.97                 | 0.267                 | 0.08            | 0.00014          |
| APPROACH                          | MEAN    | 0.326                     | 1145.895              | 4.50                    | 0.024              | 85.94                | 0.286                 | 103.30          | 0.00024          |
|                                   | STD DEV | 0.321                     | 19.792                | 0.0                     | 0.024              | 1.48                 | 0.281                 | 0.15            | 0.00023          |
| TAXI-IDLE                         | MEAN    | 1.158                     | 677.688               | 7.00                    | 0.068              | 79.06                | 1.687                 | 32.14           | 0.00210          |
|                                   | STD DEV | 1.424                     | 67.967                | 0.0                     | 0.083              | 7.93                 | 2.037                 | 0.0             | 0.00258          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.296              | 490.73               |                       | 433.08          |                  |
|                                   |         |                           |                       | STD DEV:                | 0.331              | 30.21                |                       | 0.43            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 0.592              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.642              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 0.683              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.765              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.798              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 1.210              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE                         | MEAN    | 2.886                     | 677.688               | 19.00                   | 0.457               | 214.60               | 4.181                  | 87.23           | 0.00524           |
|                                   | STD DEV | 1.654                     | 67.967                | 0.0                     | 0.262               | 21.52                | 2.175                  | 0.13            | 0.00300           |
| TAKEOFF                           | MEAN    | 27.898                    | 2392.661              | 0.50                    | 0.232               | 19.94                | 11.655                 | 38.26           | 0.00608           |
|                                   | STD DEV | 11.532                    | 124.766               | 0.0                     | 0.096               | 1.04                 | 4.769                  | 0.05            | 0.00251           |
| CLIMBOUT                          | MEAN    | 22.201                    | 2188.467              | 2.50                    | 0.925               | 91.19                | 10.141                 | 172.16          | 0.00537           |
|                                   | STD DEV | 3.532                     | 95.255                | 0.0                     | 0.147               | 3.97                 | 1.550                  | 0.08            | 0.00085           |
| APPROACH                          | MEAN    | 7.323                     | 1145.895              | 4.50                    | 0.549               | 85.94                | 6.384                  | 103.30          | 0.00532           |
|                                   | STD DEV | 1.570                     | 19.792                | 0.0                     | 0.118               | 1.48                 | 1.324                  | 0.15            | 0.00114           |
| TAXI-IDLE                         | MEAN    | 2.886                     | 677.688               | 7.00                    | 0.168               | 79.06                | 4.181                  | 32.14           | 0.00524           |
|                                   | STD DEV | 1.654                     | 67.967                | 0.0                     | 0.096               | 7.93                 | 2.175                  | 0.0             | 0.00300           |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 2.332               | 490.73               |                        | 433.08          |                   |
|                                   |         |                           |                       | STD DEV:                | 0.605               | 30.21                |                        | 0.43            |                   |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 4.723               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 1.038               |                      |                        |                 |                   |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 5.385               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 1.396               |                      |                        |                 |                   |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 50.639              |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 20.932              |                      |                        |                 |                   |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br>HP-HR | LB CO /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 3.249                     | 162.770               | 19.00                   | 0.514              | 51.54                | 20.002                | 22.23           | 0.02316          |
|                                   | STD DEV | 0.286                     | 11.581                | 0.0                     | 0.045              | 3.67                 | 1.848                 | 0.33            | 0.00240          |
| TAKEOFF                           | MEAN    | 0.393                     | 365.419               | 0.50                    | 0.003              | 3.05                 | 1.082                 | 4.87            | 0.00067          |
|                                   | STD DEV | 0.309                     | 9.366                 | 0.0                     | 0.003              | 0.08                 | 0.848                 | 0.07            | 0.00052          |
| CLIMBOUT                          | MEAN    | 0.568                     | 339.093               | 2.50                    | 0.024              | 14.13                | 1.684                 | 21.94           | 0.00107          |
|                                   | STD DEV | 0.313                     | 10.361                | 0.0                     | 0.013              | 0.43                 | 0.936                 | 0.32            | 0.00058          |
| APPROACH                          | MEAN    | 2.582                     | 206.096               | 4.50                    | 0.194              | 15.46                | 12.537                | 13.16           | 0.01469          |
|                                   | STD DEV | 0.443                     | 7.348                 | 0.0                     | 0.033              | 0.55                 | 2.145                 | 0.19            | 0.00235          |
| TAXI-IDLE                         | MEAN    | 3.249                     | 162.770               | 7.00                    | 0.190              | 18.99                | 20.002                | 8.19            | 0.02316          |
|                                   | STD DEV | 0.286                     | 11.581                | 0.0                     | 0.017              | 1.35                 | 1.848                 | 0.12            | 0.00240          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.924              | 103.16               |                       | 70.39           |                  |
|                                   |         |                           |                       | STD DEV:                | 0.032              | 5.95                 |                       | 1.04            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 8.969              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.241              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 13.137             |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.601              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.556              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.435              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br>HP-HR | LB HC /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-----------------|------------------|
| TAXI-IDLE                         | MEAN    | 0.586                     | 162.770               | 19.00                   | 0.093              | 51.54                | 3.640                 | 22.23           | 0.00418          |
|                                   | STD DEV | 0.226                     | 11.581                | 0.0                     | 0.036              | 3.67                 | 1.470                 | 0.33            | 0.00166          |
| TAKEOFF                           | MEAN    | 0.055                     | 365.419               | 0.50                    | 0.000              | 3.05                 | 0.153                 | 4.87            | 0.00009          |
|                                   | STD DEV | 0.062                     | 9.366                 | 0.0                     | 0.001              | 0.08                 | 0.175                 | 0.07            | 0.00011          |
| CLIMBOUT                          | MEAN    | 0.053                     | 339.093               | 2.50                    | 0.002              | 14.13                | 0.158                 | 21.94           | 0.00010          |
|                                   | STD DEV | 0.060                     | 10.361                | 0.0                     | 0.003              | 0.43                 | 0.184                 | 0.32            | 0.00011          |
| APPROACH                          | MEAN    | 0.240                     | 206.096               | 4.50                    | 0.018              | 15.46                | 1.177                 | 13.16           | 0.00136          |
|                                   | STD DEV | 0.125                     | 7.348                 | 0.0                     | 0.009              | 0.55                 | 0.643                 | 0.19            | 0.00070          |
| TAXI-IDLE                         | MEAN    | 0.586                     | 162.770               | 7.00                    | 0.034              | 18.99                | 3.640                 | 8.19            | 0.00418          |
|                                   | STD DEV | 0.226                     | 11.581                | 0.0                     | 0.013              | 1.35                 | 1.470                 | 0.12            | 0.00166          |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.148              | 103.16               |                       | 70.39           |                  |
|                                   |         |                           |                       | STD DEV:                | 0.048              | 5.95                 |                       | 1.04            |                  |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 1.444              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.507              |                      |                       |                 |                  |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 2.100              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.695              |                      |                       |                 |                  |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 0.783              |                      |                       |                 |                  |
|                                   |         |                           |                       | STD DEV:                | 0.877              |                      |                       |                 |                  |

| MODE                              |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br>HP-HR | LB NOX /<br>HP-HR |
|-----------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-----------------|-------------------|
| TAXI-IDLE                         | MEAN    | 1.179                     | 162.770               | 19.00                   | 0.187               | 51.54                | 7.149                  | 22.23           | 0.00841           |
|                                   | STD DEV | 0.393                     | 11.581                | 0.0                     | 0.062               | 3.67                 | 1.976                  | 0.33            | 0.00283           |
| TAKEOFF                           | MEAN    | 3.639                     | 365.419               | 0.50                    | 0.030               | 3.05                 | 9.902                  | 4.87            | 0.00624           |
|                                   | STD DEV | 1.276                     | 9.366                 | 0.0                     | 0.011               | 0.08                 | 3.263                  | 0.07            | 0.00226           |
| CLIMBOUT                          | MEAN    | 3.317                     | 339.093               | 2.50                    | 0.138               | 14.13                | 9.706                  | 21.94           | 0.00631           |
|                                   | STD DEV | 1.191                     | 10.361                | 0.0                     | 0.050               | 0.43                 | 3.245                  | 0.32            | 0.00234           |
| APPROACH                          | MEAN    | 1.685                     | 206.096               | 4.50                    | 0.126               | 15.46                | 8.113                  | 13.16           | 0.00962           |
|                                   | STD DEV | 0.593                     | 7.348                 | 0.0                     | 0.044               | 0.55                 | 2.641                  | 0.19            | 0.00347           |
| TAXI-IDLE                         | MEAN    | 1.179                     | 162.770               | 7.00                    | 0.069               | 18.99                | 7.149                  | 8.19            | 0.00841           |
|                                   | STD DEV | 0.393                     | 11.581                | 0.0                     | 0.023               | 1.35                 | 1.976                  | 0.12            | 0.00283           |
| TOTAL FOR CYCLE                   |         |                           |                       | MEAN:                   | 0.550               | 103.16               |                        | 70.39           |                   |
|                                   |         |                           |                       | STD DEV:                | 0.185               | 5.95                 |                        | 1.04            |                   |
| LBS POLLUTANT/1K LB FUEL/CYCLE    |         |                           |                       | MEAN:                   | 5.275               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 1.566               |                      |                        |                 |                   |
| LBS POLLUTANT/1K HP-HR/CYCLE      |         |                           |                       | MEAN:                   | 7.831               |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 2.682               |                      |                        |                 |                   |
| LBS POLLUTANT/1000K HP-HR AT T.O. |         |                           |                       | MEAN:                   | 51.975              |                      |                        |                 |                   |
|                                   |         |                           |                       | STD DEV:                | 18.794              |                      |                        |                 |                   |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 61.752                    | 1358.432              | 19.00                   | 9.698              | 430.17               | 45.150                | 283.73            | 0.03418            |
|                                      | STD DEV | 10.965                    | 80.474                | 0.0                     | 1.736              | 25.48                | 8.210                 | 0.0               | 0.00612            |
| TAKEOFF                              | MEAN    | 29.071                    | 9959.773              | 0.70                    | 0.339              | 116.20               | 2.921                 | 130.67            | 0.00260            |
|                                      | STD DEV | 4.213                     | 251.241               | 0.0                     | 0.049              | 2.93                 | 0.437                 | 0.13              | 0.00038            |
| CLIMBOUT                             | MEAN    | 28.876                    | 8290.375              | 2.20                    | 1.059              | 303.98               | 3.488                 | 349.07            | 0.00303            |
|                                      | STD DEV | 4.592                     | 181.826               | 0.0                     | 0.168              | 6.67                 | 0.584                 | 0.0               | 0.00048            |
| APPROACH                             | MEAN    | 42.825                    | 3776.597              | 4.00                    | 2.855              | 251.77               | 11.509                | 298.67            | 0.00956            |
|                                      | STD DEV | 14.524                    | 314.310               | 0.0                     | 0.968              | 20.95                | 4.613                 | 0.0               | 0.00324            |
| TAXI-IDLE                            | MEAN    | 61.252                    | 1358.432              | 7.00                    | 3.573              | 158.48               | 45.150                | 104.53            | 0.03418            |
|                                      | STD DEV | 10.965                    | 80.474                | 0.0                     | 0.640              | 9.39                 | 8.210                 | 0.09              | 0.00612            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 17.524             | 1260.60              |                       | 1166.66           |                    |
|                                      |         |                           |                       | STD DEV:                | 3.140              | 51.81                |                       | 1.81              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 13.923             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.622              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 15.021             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.692              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 3.028              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.439              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 15.426                    | 1358.432              | 19.00                   | 2.442              | 430.17               | 11.306                | 283.73            | 0.00861            |
|                                      | STD DEV | 6.589                     | 80.474                | 0.0                     | 1.043              | 25.48                | 4.718                 | 0.0               | 0.00368            |
| TAKEOFF                              | MEAN    | 0.556                     | 9959.773              | 0.70                    | 0.006              | 116.20               | 0.056                 | 130.67            | 0.00005            |
|                                      | STD DEV | 0.547                     | 251.241               | 0.0                     | 0.006              | 2.93                 | 0.054                 | 0.13              | 0.00005            |
| CLIMBOUT                             | MEAN    | 0.583                     | 8290.375              | 2.20                    | 0.021              | 303.98               | 0.070                 | 349.07            | 0.00006            |
|                                      | STD DEV | 0.442                     | 181.826               | 0.0                     | 0.016              | 6.67                 | 0.053                 | 0.0               | 0.00005            |
| APPROACH                             | MEAN    | 2.427                     | 3776.597              | 4.00                    | 0.162              | 251.77               | 0.645                 | 298.67            | 0.00054            |
|                                      | STD DEV | 1.982                     | 314.310               | 0.0                     | 0.125              | 20.95                | 0.493                 | 0.0               | 0.00042            |
| TAXI-IDLE                            | MEAN    | 15.426                    | 1358.432              | 7.00                    | 0.900              | 158.48               | 11.306                | 104.53            | 0.00861            |
|                                      | STD DEV | 6.589                     | 80.474                | 0.0                     | 0.384              | 9.39                 | 4.718                 | 0.09              | 0.00368            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 3.532              | 1260.60              |                       | 1166.66           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.520              | 51.81                |                       | 1.81              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 2.794              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.185              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 3.027              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.303              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.579              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.570              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 2.822                     | 1358.432              | 19.00                   | 0.447               | 430.17               | 2.072                 | 283.73            | 0.00157            |
|                                      | STD DEV | 0.374                     | 80.474                | 0.0                     | 0.059               | 25.48                | 0.181                 | 0.0               | 0.00021            |
| TAKEOFF                              | MEAN    | 110.632                   | 9959.773              | 0.70                    | 1.291               | 116.20               | 11.086                | 130.67            | 0.00988            |
|                                      | STD DEV | 17.743                    | 251.241               | 0.0                     | 0.207               | 2.93                 | 1.565                 | 0.13              | 0.00158            |
| CLIMBOUT                             | MEAN    | 73.982                    | 8290.375              | 2.20                    | 2.713               | 303.98               | 8.917                 | 349.07            | 0.00777            |
|                                      | STD DEV | 6.116                     | 181.826               | 0.0                     | 0.224               | 6.67                 | 0.600                 | 0.0               | 0.00064            |
| APPROACH                             | MEAN    | 17.845                    | 3776.597              | 4.00                    | 1.190               | 251.77               | 4.739                 | 298.67            | 0.00398            |
|                                      | STD DEV | 1.362                     | 314.310               | 0.0                     | 0.091               | 20.95                | 0.336                 | 0.0               | 0.00030            |
| TAXI-IDLE                            | MEAN    | 2.822                     | 1358.432              | 7.00                    | 0.165               | 158.48               | 2.072                 | 104.53            | 0.00157            |
|                                      | STD DEV | 0.374                     | 80.474                | 0.0                     | 0.027               | 9.39                 | 0.181                 | 0.09              | 0.00021            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 5.804               | 1260.60              |                       | 1166.66           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.334               | 51.81                |                       | 1.81              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 4.610               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.301               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.975               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.286               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 115.242             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 18.482              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 79.964                    | 1613.686              | 19.00                   | 12.661             | 511.00               | 50.073                | 375.48            | 0.03368            |
|                                      | STD DEV | 42.603                    | 85.354                | 0.0                     | 6.745              | 27.02                | 26.690                | 11.97             | 0.01765            |
| TAKEOFF                              | MEAN    | 9.036                     | 10183.211             | 0.70                    | 0.105              | 118.80               | 0.879                 | 138.33            | 0.00076            |
|                                      | STD DEV | 7.896                     | 413.273               | 0.0                     | 0.092              | 4.82                 | 0.756                 | 4.41              | 0.00066            |
| CLIMBOUT                             | MEAN    | 15.957                    | 8509.188              | 2.20                    | 0.585              | 312.00               | 1.873                 | 369.55            | 0.00158            |
|                                      | STD DEV | 8.429                     | 342.477               | 0.0                     | 0.309              | 12.56                | 0.972                 | 11.78             | 0.00082            |
| APPROACH                             | MEAN    | 49.015                    | 4115.418              | 4.00                    | 3.268              | 274.36               | 12.199                | 316.19            | 0.01030            |
|                                      | STD DEV | 23.793                    | 245.341               | 0.0                     | 1.586              | 16.36                | 6.355                 | 10.08             | 0.00489            |
| TAXI-IDLE                            | MEAN    | 79.964                    | 1613.686              | 7.00                    | 4.665              | 188.26               | 50.073                | 138.33            | 0.03368            |
|                                      | STD DEV | 42.603                    | 85.354                | 0.0                     | 2.485              | 9.96                 | 26.690                | 4.41              | 0.01765            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 21.284             | 1404.43              |                       | 1337.88           |                    |
|                                      |         |                           |                       | STD DEV:                | 10.969             | 57.76                |                       | 42.69             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 15.309             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 7.957              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 15.882             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 8.038              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.882              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.764              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 34.294                    | 1613.686              | 19.00                   | 5.430              | 511.00               | 21.355                | 375.48            | 0.01438            |
|                                      | STD DEV | 34.950                    | 85.354                | 0.0                     | 5.534              | 27.02                | 21.049                | 11.97             | 0.01451            |
| TAKEOFF                              | MEAN    | 0.855                     | 10183.211             | 0.70                    | 0.010              | 118.80               | 0.086                 | 138.33            | 0.00007            |
|                                      | STD DEV | 1.346                     | 413.273               | 0.0                     | 0.016              | 4.82                 | 0.135                 | 4.41              | 0.00012            |
| CLIMBOUT                             | MEAN    | 0.893                     | 8509.188              | 2.20                    | 0.033              | 312.00               | 0.106                 | 369.55            | 0.00009            |
|                                      | STD DEV | 0.598                     | 342.477               | 0.0                     | 0.022              | 12.56                | 0.071                 | 11.78             | 0.00006            |
| APPROACH                             | MEAN    | 8.261                     | 4115.418              | 4.00                    | 0.551              | 274.36               | 2.018                 | 316.19            | 0.00173            |
|                                      | STD DEV | 6.687                     | 245.341               | 0.0                     | 0.446              | 16.36                | 1.626                 | 10.08             | 0.00139            |
| TAXI-IDLE                            | MEAN    | 34.294                    | 1613.686              | 7.00                    | 2.001              | 188.26               | 21.355                | 138.33            | 0.01438            |
|                                      | STD DEV | 34.950                    | 85.354                | 0.0                     | 2.039              | 9.96                 | 21.049                | 4.41              | 0.01451            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 8.024              | 1404.43              |                       | 1337.88           |                    |
|                                      |         |                           |                       | STD DEV:                | 7.979              | 57.76                |                       | 42.69             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.735              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.565              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 5.964              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.871              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.864              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.362              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 4.168                     | 1613.686              | 19.00                   | 0.660               | 511.00               | 2.596                  | 375.48            | 0.00176             |
|                                      | STD DEV | 0.764                     | 85.354                | 0.0                     | 0.121               | 27.02                | 0.530                  | 11.97             | 0.00030             |
| TAKEOFF                              | MEAN    | 119.008                   | 10183.211             | 0.70                    | 1.388               | 118.80               | 11.637                 | 138.33            | 0.01000             |
|                                      | STD DEV | 75.788                    | 413.273               | 0.0                     | 0.301               | 4.82                 | 2.240                  | 4.41              | 0.00201             |
| CLIMBOUT                             | MEAN    | 84.675                    | 8509.188              | 2.20                    | 3.105               | 312.00               | 9.929                  | 369.55            | 0.00839             |
|                                      | STD DEV | 13.642                    | 342.477               | 0.0                     | 0.500               | 12.56                | 1.398                  | 11.78             | 0.00122             |
| APPROACH                             | MEAN    | 23.212                    | 4115.418              | 4.00                    | 1.547               | 274.36               | 5.654                  | 316.19            | 0.00490             |
|                                      | STD DEV | 2.698                     | 245.341               | 0.0                     | 0.180               | 16.36                | 0.734                  | 10.08             | 0.00061             |
| TAXI-IDLE                            | MEAN    | 4.168                     | 1613.686              | 7.00                    | 0.243               | 188.26               | 2.596                  | 138.33            | 0.00176             |
|                                      | STD DEV | 0.764                     | 85.354                | 0.0                     | 0.045               | 9.96                 | 0.530                  | 4.41              | 0.00030             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 6.944               | 1404.43              |                        | 1337.88           |                     |
|                                      |         |                           |                       | STD DEV:                | 0.970               | 57.76                |                        | 42.69             |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 4.953               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.750               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 5.183               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.649               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 116.722             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 23.396              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 68.835                    | 1379.321              | 19.00                   | 10.899             | 436.78               | 48.865                | 585.83            | 0.01855            |
|                                      | STD DEV | 37.515                    | 241.812               | 0.0                     | 5.940              | 76.58                | 22.791                | 36.14             | 0.01007            |
| TAKEOFF                              | MEAN    | 12.269                    | 10835.289             | 0.70                    | 0.143              | 126.41               | 1.137                 | 215.83            | 0.00066            |
|                                      | STD DEV | 8.507                     | 821.060               | 0.0                     | 0.099              | 9.58                 | 0.781                 | 13.32             | 0.00045            |
| CLIMBOUT                             | MEAN    | 15.303                    | 8955.805              | 2.20                    | 0.561              | 328.38               | 1.735                 | 576.58            | 0.00098            |
|                                      | STD DEV | 7.927                     | 662.439               | 0.0                     | 0.291              | 24.29                | 0.940                 | 35.57             | 0.00052            |
| APPROACH                             | MEAN    | 39.678                    | 4137.551              | 4.00                    | 2.645              | 275.84               | 9.634                 | 493.33            | 0.00539            |
|                                      | STD DEV | 19.986                    | 350.089               | 0.0                     | 1.332              | 23.34                | 4.850                 | 30.43             | 0.00280            |
| TAXI-IDLE                            | MEAN    | 68.835                    | 1379.321              | 7.00                    | 4.015              | 160.92               | 48.865                | 215.83            | 0.01855            |
|                                      | STD DEV | 37.515                    | 241.812               | 0.0                     | 2.188              | 28.21                | 22.791                | 13.32             | 0.01007            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 18.264             | 1328.33              |                       | 2087.41           |                    |
|                                      |         |                           |                       | STD DEV:                | 8.963              | 138.11               |                       | 128.65            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 13.548             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 6.031              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 8.734              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.290              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.768              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.522              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 41.225                    | 1379.321              | 19.00                   | 6.527              | 436.78               | 30.301                | 585.83            | 0.01113            |
|                                      | STD DEV | 28.748                    | 241.812               | 0.0                     | 4.552              | 76.58                | 20.478                | 36.14             | 0.00773            |
| TAKEOFF                              | MEAN    | 4.654                     | 10835.289             | 0.70                    | 0.054              | 126.41               | 0.416                 | 215.83            | 0.00025            |
|                                      | STD DEV | 8.731                     | 821.060               | 0.0                     | 0.102              | 9.58                 | 0.783                 | 13.32             | 0.00048            |
| CLIMBOUT                             | MEAN    | 4.915                     | 8955.805              | 2.20                    | 0.180              | 328.38               | 0.536                 | 576.58            | 0.00031            |
|                                      | STD DEV | 8.419                     | 662.439               | 0.0                     | 0.309              | 24.29                | 0.912                 | 35.57             | 0.00055            |
| APPROACH                             | MEAN    | 7.842                     | 4137.551              | 4.00                    | 0.523              | 275.84               | 1.884                 | 493.33            | 0.00107            |
|                                      | STD DEV | 6.332                     | 350.089               | 0.0                     | 0.422              | 23.34                | 1.491                 | 30.43             | 0.00089            |
| TAXI-IDLE                            | MEAN    | 41.225                    | 1379.321              | 7.00                    | 2.405              | 160.92               | 30.301                | 215.83            | 0.01113            |
|                                      | STD DEV | 28.748                    | 241.812               | 0.0                     | 1.677              | 28.21                | 20.478                | 13.32             | 0.00773            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 9.689              | 1328.33              |                       | 2087.41           |                    |
|                                      |         |                           |                       | STD DEV:                | 6.206              | 138.11               |                       | 128.65            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 7.256              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.498              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.642              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.961              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 2.933              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 5.627              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 3.208                     | 1379.321              | 19.00                   | 0.508               | 436.78               | 2.342                 | 585.83            | 0.00087            |
|                                      | STD DEV | 0.801                     | 241.812               | 0.0                     | 0.127               | 76.58                | 0.528                 | 36.14             | 0.00020            |
| TAKEOFF                              | MEAN    | 148.125                   | 10835.289             | 0.70                    | 1.728               | 126.41               | 13.613                | 215.83            | 0.00798            |
|                                      | STD DEV | 25.842                    | 821.060               | 0.0                     | 0.301               | 9.58                 | 1.656                 | 13.32             | 0.00106            |
| CLIMBOUT                             | MEAN    | 96.218                    | 8955.805              | 2.20                    | 3.528               | 328.38               | 10.720                | 576.58            | 0.00610            |
|                                      | STD DEV | 14.259                    | 662.439               | 0.0                     | 0.523               | 24.29                | 1.097                 | 35.57             | 0.00066            |
| APPROACH                             | MEAN    | 21.784                    | 4137.551              | 4.00                    | 1.452               | 275.84               | 5.277                 | 493.33            | 0.00294            |
|                                      | STD DEV | 3.099                     | 350.089               | 0.0                     | 0.207               | 23.34                | 0.694                 | 30.43             | 0.00035            |
| TAXI-IDLE                            | MEAN    | 3.208                     | 1379.321              | 7.00                    | 0.187               | 160.92               | 2.342                 | 215.83            | 0.00087            |
|                                      | STD DEV | 0.801                     | 241.812               | 0.0                     | 0.047               | 28.21                | 0.528                 | 13.32             | 0.00020            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 7.404               | 1328.33              |                       | 2087.41           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.072               | 138.11               |                       | 128.65            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.596               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.729               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 3.538               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.375               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 93.083              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 12.371              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 45.917                    | 2061.813              | 19.00                   | 7.270              | 652.91               | 22.282                | 554.17            | 0.01312            |
|                                      | STD DEV | 24.398                    | 107.011               | 0.0                     | 3.863              | 33.89                | 11.867                | 0.38              | 0.00697            |
| TAKEOFF                              | MEAN    | 18.823                    | 15511.203             | 0.70                    | 0.220              | 180.96               | 1.214                 | 204.17            | 0.00108            |
|                                      | STD DEV | 3.994                     | 427.062               | 0.0                     | 0.047              | 4.98                 | 0.238                 | 0.0               | 0.00023            |
| CLIMBOUT                             | MEAN    | 18.277                    | 13066.484             | 2.20                    | 0.670              | 479.10               | 1.399                 | 545.42            | 0.00123            |
|                                      | STD DEV | 3.129                     | 240.685               | 0.0                     | 0.115              | 8.78                 | 0.235                 | 0.0               | 0.00021            |
| APPROACH                             | MEAN    | 26.326                    | 5993.734              | 4.00                    | 1.755              | 399.58               | 4.412                 | 466.67            | 0.00376            |
|                                      | STD DEV | 9.529                     | 324.933               | 0.0                     | 0.635              | 21.66                | 1.671                 | 0.0               | 0.00136            |
| TAXI-IDLE                            | MEAN    | 45.917                    | 2061.813              | 7.00                    | 2.678              | 240.54               | 22.282                | 204.17            | 0.01312            |
|                                      | STD DEV | 24.398                    | 107.011               | 0.0                     | 1.423              | 12.49                | 11.867                | 0.0               | 0.00697            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 12.593             | 1953.10              |                       | 1974.58           |                    |
|                                      |         |                           |                       | STD DEV:                | 5.922              | 71.33                |                       | 2.62              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 6.462              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.067              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.378              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.999              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 1.255              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.266              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 23.018                    | 2061.813              | 19.00                   | 3.645              | 652.91               | 11.183                | 554.17            | 0.00658            |
|                                      | STD DEV | 14.995                    | 107.011               | 0.0                     | 2.374              | 33.89                | 7.427                 | 0.38              | 0.00428            |
| TAKEOFF                              | MEAN    | 0.674                     | 15511.203             | 0.70                    | 0.008              | 180.96               | 0.043                 | 204.17            | 0.00004            |
|                                      | STD DEV | 0.934                     | 427.062               | 0.0                     | 0.011              | 4.98                 | 0.060                 | 0.0               | 0.00005            |
| CLIMBOUT                             | MEAN    | 1.274                     | 13066.484             | 2.20                    | 0.047              | 479.10               | 0.096                 | 545.42            | 0.00009            |
|                                      | STD DEV | 2.120                     | 240.685               | 0.0                     | 0.078              | 8.78                 | 0.160                 | 0.0               | 0.00014            |
| APPROACH                             | MEAN    | 3.834                     | 5993.734              | 4.00                    | 0.256              | 399.58               | 0.646                 | 466.67            | 0.00055            |
|                                      | STD DEV | 2.383                     | 324.933               | 0.0                     | 0.159              | 21.66                | 0.413                 | 0.0               | 0.00034            |
| TAXI-IDLE                            | MEAN    | 23.018                    | 2061.813              | 7.00                    | 1.343              | 240.54               | 11.183                | 204.17            | 0.00658            |
|                                      | STD DEV | 14.995                    | 107.011               | 0.0                     | 0.875              | 12.49                | 7.427                 | 0.0               | 0.00428            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 5.297              | 1953.10              |                       | 1974.58           |                    |
|                                      |         |                           |                       | STD DEV:                | 3.378              | 71.33                |                       | 2.62              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 2.711              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.733              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 2.683              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.711              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.449              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.623              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 5.608                     | 2061.813              | 19.00                   | 0.888               | 652.91               | 2.714                  | 554.17            | 0.00160             |
|                                      | STD DEV | 0.754                     | 107.011               | 0.0                     | 0.119               | 33.89                | 0.270                  | 0.38              | 0.00022             |
| TAKEOFF                              | MEAN    | 236.335                   | 15511.203             | 0.70                    | 2.757               | 180.96               | 15.224                 | 204.17            | 0.01350             |
|                                      | STD DEV | 28.993                    | 427.062               | 0.0                     | 0.338               | 4.98                 | 1.714                  | 0.0               | 0.00166             |
| CLIMBOUT                             | MEAN    | 155.298                   | 13066.484             | 2.20                    | 5.694               | 479.10               | 11.881                 | 545.42            | 0.01044             |
|                                      | STD DEV | 9.813                     | 240.685               | 0.0                     | 0.360               | 8.78                 | 0.641                  | 0.0               | 0.00066             |
| APPROACH                             | MEAN    | 35.859                    | 5993.734              | 4.00                    | 2.391               | 399.58               | 5.976                  | 466.67            | 0.00512             |
|                                      | STD DEV | 4.203                     | 324.933               | 0.0                     | 0.280               | 21.66                | 0.526                  | 0.0               | 0.00060             |
| TAXI-IDLE                            | MEAN    | 5.608                     | 2061.813              | 7.00                    | 0.327               | 240.54               | 2.714                  | 204.17            | 0.00160             |
|                                      | STD DEV | 0.754                     | 107.011               | 0.0                     | 0.044               | 12.49                | 0.270                  | 0.0               | 0.00022             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 12.057              | 1953.10              |                        | 1974.58           |                     |
|                                      |         |                           |                       | STD DEV:                | 0.669               | 71.33                |                        | 2.62              |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 6.176               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.340               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.106               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.339               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 157.557             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 19.329              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 38.771                    | 1130.935              | 19.00                   | 8.189              | 358.13               | 34.153                | 399.00            | 0.02052            |
|                                      | STD DEV | 6.410                     | 66.837                | 0.0                     | 1.354              | 21.16                | 4.335                 | 0.0               | 0.00339            |
| TAKEOFF                              | MEAN    | 7.975                     | 8517.727              | 0.70                    | 0.093              | 99.37                | 0.934                 | 163.33            | 0.00057            |
|                                      | STD DEV | 3.354                     | 165.892               | 0.0                     | 0.039              | 1.94                 | 0.368                 | 0.0               | 0.00024            |
| CLIMBOUT                             | MEAN    | 10.621                    | 7116.582              | 2.20                    | 0.389              | 260.94               | 1.493                 | 436.33            | 0.00089            |
|                                      | STD DEV | 4.385                     | 95.555                | 0.0                     | 0.161              | 3.51                 | 0.617                 | 0.0               | 0.00037            |
| APPROACH                             | MEAN    | 17.920                    | 3445.414              | 4.00                    | 1.195              | 229.69               | 5.210                 | 373.33            | 0.00320            |
|                                      | STD DEV | 1.665                     | 180.022               | 0.0                     | 0.111              | 12.00                | 0.518                 | 0.0               | 0.00030            |
| TAXI-IDLE                            | MEAN    | 38.771                    | 1130.935              | 7.00                    | 3.017              | 131.94               | 34.153                | 147.00            | 0.02052            |
|                                      | STD DEV | 6.410                     | 66.837                | 0.0                     | 0.499              | 7.80                 | 4.335                 | 0.10              | 0.00339            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 12.883             | 1080.08              |                       | 1519.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 2.020              | 30.02                |                       | 2.35              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 11.905             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.659              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 8.481              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.330              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.665              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.279              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 6.199                     | 1130.935              | 19.00                   | 1.309              | 358.13               | 5.515                 | 399.00            | 0.00328            |
|                                      | STD DEV | 1.506                     | 66.837                | 0.0                     | 0.318              | 21.16                | 1.449                 | 0.0               | 0.00080            |
| TAKEOFF                              | MEAN    | 0.373                     | 8517.727              | 0.70                    | 0.004              | 99.37                | 0.043                 | 163.33            | 0.00003            |
|                                      | STD DEV | 0.563                     | 165.892               | 0.0                     | 0.007              | 1.94                 | 0.066                 | 0.0               | 0.00004            |
| CLIMBOUT                             | MEAN    | 0.313                     | 7116.582              | 2.20                    | 0.011              | 260.94               | 0.044                 | 436.33            | 0.00003            |
|                                      | STD DEV | 0.459                     | 95.555                | 0.0                     | 0.017              | 3.51                 | 0.065                 | 0.0               | 0.00004            |
| APPROACH                             | MEAN    | 1.179                     | 3445.414              | 4.00                    | 0.079              | 229.69               | 0.332                 | 373.33            | 0.00021            |
|                                      | STD DEV | 1.372                     | 180.022               | 0.0                     | 0.091              | 12.00                | 0.368                 | 0.0               | 0.00024            |
| TAXI-IDLE                            | MEAN    | 6.199                     | 1130.935              | 7.00                    | 0.482              | 131.94               | 5.515                 | 147.00            | 0.00328            |
|                                      | STD DEV | 1.506                     | 66.837                | 0.0                     | 0.117              | 7.80                 | 1.449                 | 0.10              | 0.00080            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 1.886              | 1080.08              |                       | 1519.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.444              | 30.02                |                       | 2.35              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 1.751              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.432              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 1.242              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.292              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.311              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.469              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 2.958                     | 1130.935              | 19.00                   | 0.625               | 358.13               | 2.624                 | 399.00            | 0.00157            |
|                                      | STD DEV | 0.349                     | 66.837                | 0.0                     | 0.074               | 21.16                | 0.352                 | 0.0               | 0.00018            |
| TAKEOFF                              | MEAN    | 101.636                   | 8517.727              | 0.70                    | 1.186               | 99.37                | 11.930                | 163.33            | 0.00726            |
|                                      | STD DEV | 14.360                    | 165.892               | 0.0                     | 0.168               | 1.94                 | 1.644                 | 0.0               | 0.00103            |
| CLIMBOUT                             | MEAN    | 67.746                    | 7116.582              | 2.20                    | 2.484               | 260.94               | 9.517                 | 436.33            | 0.00569            |
|                                      | STD DEV | 11.251                    | 95.555                | 0.0                     | 0.413               | 3.51                 | 1.559                 | 0.0               | 0.00095            |
| APPROACH                             | MEAN    | 16.952                    | 3445.414              | 4.00                    | 1.130               | 229.69               | 4.959                 | 373.33            | 0.00303            |
|                                      | STD DEV | 2.870                     | 180.022               | 0.0                     | 0.191               | 12.00                | 1.097                 | 0.0               | 0.00051            |
| TAXI-IDLE                            | MEAN    | 2.958                     | 1130.935              | 7.00                    | 0.230               | 131.94               | 2.624                 | 147.00            | 0.00157            |
|                                      | STD DEV | 0.349                     | 66.837                | 0.0                     | 0.027               | 7.80                 | 0.352                 | 0.10              | 0.00018            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 5.655               | 1080.08              |                       | 1519.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.631               | 30.02                |                       | 2.35              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 5.249               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.703               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 3.723               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.415               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 84.697              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 11.967              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 24.677                    | 1134.241              | 19.00                   | 5.212              | 359.18               | 22.234                | 413.25            | 0.01261            |
|                                      | STD DEV | 10.147                    | 107.287               | 0.0                     | 2.143              | 33.97                | 9.223                 | 1.11              | 0.00519            |
| TAKEOFF                              | MEAN    | 5.617                     | 8677.555              | 0.70                    | 0.066              | 101.24               | 0.648                 | 169.17            | 0.00039            |
|                                      | STD DEV | 1.997                     | 210.983               | 0.0                     | 0.023              | 2.45                 | 0.232                 | 0.11              | 0.00014            |
| CLIMBOUT                             | MEAN    | 6.204                     | 7171.270              | 2.20                    | 0.227              | 262.95               | 0.867                 | 451.92            | 0.00050            |
|                                      | STD DEV | 1.928                     | 160.470               | 0.0                     | 0.071              | 5.88                 | 0.274                 | 0.94              | 0.00016            |
| APPROACH                             | MEAN    | 11.960                    | 3572.512              | 4.00                    | 0.797              | 238.17               | 3.420                 | 386.67            | 0.00206            |
|                                      | STD DEV | 4.937                     | 452.440               | 0.0                     | 0.329              | 30.16                | 1.486                 | 0.59              | 0.00085            |
| TAXI-IDLE                            | MEAN    | 24.677                    | 1134.241              | 7.00                    | 1.920              | 132.33               | 22.234                | 152.25            | 0.01261            |
|                                      | STD DEV | 10.147                    | 107.287               | 0.0                     | 0.790              | 12.52                | 9.223                 | 0.12              | 0.00519            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 8.223              | 1093.86              |                       | 1573.25           |                    |
|                                      |         |                           |                       | STD DEV:                | 3.201              | 66.40                |                       | 1.68              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 7.610              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.020              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 5.227              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.034              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.452              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.161              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 5.422                     | 1134.241              | 19.00                   | 1.145              | 359.18               | 5.013                 | 413.25            | 0.00277            |
|                                      | STD DEV | 7.066                     | 107.287               | 0.0                     | 1.492              | 33.97                | 7.130                 | 1.11              | 0.00361            |
| TAKEOFF                              | MEAN    | 0.381                     | 8677.555              | 0.70                    | 0.004              | 101.24               | 0.044                 | 169.17            | 0.00003            |
|                                      | STD DEV | 0.840                     | 210.983               | 0.0                     | 0.010              | 2.45                 | 0.097                 | 0.11              | 0.00006            |
| CLIMBOUT                             | MEAN    | 0.396                     | 7171.270              | 2.20                    | 0.015              | 262.95               | 0.055                 | 451.92            | 0.00003            |
|                                      | STD DEV | 0.736                     | 160.470               | 0.0                     | 0.027              | 5.88                 | 0.098                 | 0.94              | 0.00006            |
| APPROACH                             | MEAN    | 0.850                     | 3572.512              | 4.00                    | 0.057              | 238.17               | 0.224                 | 386.67            | 0.00015            |
|                                      | STD DEV | 0.913                     | 452.440               | 0.0                     | 0.061              | 30.16                | 0.195                 | 0.59              | 0.00016            |
| TAXI-IDLE                            | MEAN    | 5.422                     | 1134.241              | 7.00                    | 0.422              | 132.33               | 5.013                 | 152.25            | 0.00277            |
|                                      | STD DEV | 7.066                     | 107.287               | 0.0                     | 0.550              | 12.52                | 7.130                 | 0.12              | 0.00361            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 1.643              | 1093.86              |                       | 1573.25           |                    |
|                                      |         |                           |                       | STD DEV:                | 2.045              | 66.40                |                       | 1.68              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 1.538              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.025              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 1.044              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.300              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.307              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.676              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 2.908                     | 1134.241              | 19.00                   | 0.614               | 359.18               | 2.584                  | 413.25            | 0.00149             |
|                                      | STD DEV | 0.708                     | 107.287               | 0.0                     | 0.150               | 33.97                | 0.718                  | 1.11              | 0.00036             |
| TAKEOFF                              | MEAN    | 133.295                   | 8677.555              | 0.70                    | 1.555               | 101.24               | 15.344                 | 169.17            | 0.00919             |
|                                      | STD DEV | 33.587                    | 210.983               | 0.0                     | 0.392               | 2.45                 | 3.825                  | 0.11              | 0.00232             |
| CLIMBOUT                             | MEAN    | 86.972                    | 7171.270              | 2.20                    | 3.189               | 262.95               | 12.111                 | 451.92            | 0.00706             |
|                                      | STD DEV | 19.477                    | 160.470               | 0.0                     | 0.714               | 5.88                 | 2.631                  | 0.94              | 0.00158             |
| APPROACH                             | MEAN    | 20.242                    | 3572.512              | 4.00                    | 1.349               | 238.17               | 5.663                  | 386.67            | 0.00349             |
|                                      | STD DEV | 5.826                     | 452.440               | 0.0                     | 0.388               | 30.16                | 1.509                  | 0.59              | 0.00100             |
| TAXI-IDLE                            | MEAN    | 2.908                     | 1134.241              | 7.00                    | 0.226               | 132.33               | 2.584                  | 152.25            | 0.00149             |
|                                      | STD DEV | 0.708                     | 107.287               | 0.0                     | 0.055               | 12.52                | 0.718                  | 0.12              | 0.00036             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 6.934               | 1093.86              |                        | 1573.25           |                     |
|                                      |         |                           |                       | STD DEV:                | 1.607               | 66.40                |                        | 1.68              |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 6.348               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 1.538               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 4.407               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 1.027               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 107.249             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 27.024              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 42.965                    | 1158.716              | 19.00                   | 9.075              | 366.93               | 37.890                | 399.00            | 0.02274            |
|                                      | STD DEV | 10.107                    | 210.721               | 0.0                     | 2.135              | 66.73                | 9.093                 | 0.0               | 0.00535            |
| TAKEOFF                              | MEAN    | 18.544                    | 8407.422              | 0.70                    | 0.216              | 98.09                | 2.224                 | 163.33            | 0.00132            |
|                                      | STD DEV | 15.916                    | 181.373               | 0.0                     | 0.186              | 2.12                 | 1.961                 | 0.0               | 0.00114            |
| CLIMBOUT                             | MEAN    | 19.403                    | 7098.539              | 2.20                    | 0.711              | 260.28               | 2.759                 | 436.33            | 0.00163            |
|                                      | STD DEV | 14.506                    | 179.837               | 0.0                     | 0.532              | 6.60                 | 2.135                 | 0.0               | 0.00122            |
| APPROACH                             | MEAN    | 32.325                    | 3458.895              | 4.00                    | 2.155              | 230.59               | 9.468                 | 373.33            | 0.00577            |
|                                      | STD DEV | 9.911                     | 208.301               | 0.0                     | 0.661              | 13.89                | 3.253                 | 0.0               | 0.00177            |
| TAXI-IDLE                            | MEAN    | 42.965                    | 1158.716              | 7.00                    | 3.343              | 135.18               | 37.890                | 147.00            | 0.02274            |
|                                      | STD DEV | 10.107                    | 210.721               | 0.0                     | 0.786              | 24.58                | 9.093                 | 0.10              | 0.00535            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 15.501             | 1091.07              |                       | 1519.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 3.356              | 105.81               |                       | 2.35              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 14.363             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.457              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 10.205             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.210              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 1.545              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.326              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 8.845                     | 1158.716              | 19.00                   | 1.868              | 366.93               | 7.391                 | 399.00            | 0.00468            |
|                                      | STD DEV | 4.791                     | 210.721               | 0.0                     | 1.012              | 66.73                | 3.565                 | 0.0               | 0.00254            |
| TAKEOFF                              | MEAN    | 0.316                     | 8407.422              | 0.70                    | 0.004              | 98.09                | 0.038                 | 163.33            | 0.00002            |
|                                      | STD DEV | 0.321                     | 181.373               | 0.0                     | 0.004              | 2.12                 | 0.039                 | 0.0               | 0.00002            |
| CLIMBOUT                             | MEAN    | 0.827                     | 7098.539              | 2.20                    | 0.030              | 260.28               | 0.117                 | 436.33            | 0.00007            |
|                                      | STD DEV | 1.042                     | 179.837               | 0.0                     | 0.038              | 6.60                 | 0.146                 | 0.0               | 0.00009            |
| APPROACH                             | MEAN    | 3.343                     | 3458.895              | 4.00                    | 0.223              | 230.59               | 0.977                 | 373.33            | 0.00060            |
|                                      | STD DEV | 2.180                     | 208.301               | 0.0                     | 0.145              | 13.89                | 0.656                 | 0.0               | 0.00039            |
| TAXI-IDLE                            | MEAN    | 8.845                     | 1158.716              | 7.00                    | 0.688              | 135.18               | 7.391                 | 147.00            | 0.00468            |
|                                      | STD DEV | 4.791                     | 210.721               | 0.0                     | 0.373              | 24.58                | 3.565                 | 0.10              | 0.00254            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 2.813              | 1091.07              |                       | 1519.00           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.495              | 105.81               |                       | 2.35              |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 2.533              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.281              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 1.852              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.984              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.263              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.268              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX /<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|------------------------|-------------------|---------------------|
| TAXI-IDLE                            | MEAN    | 4.393                     | 1158.716              | 19.00                   | 0.928               | 366.93               | 3.732                  | 399.00            | 0.00233             |
|                                      | STD DEV | 1.608                     | 210.721               | 0.0                     | 0.340               | 66.73                | 0.923                  | 0.0               | 0.00085             |
| TAKEOFF                              | MEAN    | 151.272                   | 8407.422              | 0.70                    | 1.765               | 98.09                | 18.000                 | 163.33            | 0.01081             |
|                                      | STD DEV | 21.703                    | 181.373               | 0.0                     | 0.293               | 2.12                 | 2.561                  | 0.0               | 0.00155             |
| CLIMBOUT                             | MEAN    | 100.144                   | 7098.539              | 2.20                    | 3.672               | 260.28               | 14.116                 | 436.33            | 0.00842             |
|                                      | STD DEV | 19.169                    | 179.837               | 0.0                     | 0.703               | 6.60                 | 2.679                  | 0.0               | 0.00161             |
| APPROACH                             | MEAN    | 28.048                    | 3458.895              | 4.00                    | 1.870               | 230.59               | 8.128                  | 373.33            | 0.00501             |
|                                      | STD DEV | 3.055                     | 208.301               | 0.0                     | 0.204               | 13.89                | 0.957                  | 0.0               | 0.00055             |
| TAXI-IDLE                            | MEAN    | 4.393                     | 1158.716              | 7.00                    | 0.342               | 135.18               | 3.732                  | 147.00            | 0.00233             |
|                                      | STD DEV | 1.608                     | 210.721               | 0.0                     | 0.125               | 24.58                | 0.923                  | 0.10              | 0.00085             |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 9.576               | 1091.07              |                        | 1519.00           |                     |
|                                      |         |                           |                       | STD DEV:                | 1.077               | 105.81               |                        | 2.35              |                     |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 7.913               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 1.121               |                      |                        |                   |                     |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 5.646               |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 0.709               |                      |                        |                   |                     |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 126.060             |                      |                        |                   |                     |
|                                      |         |                           |                       | STD DEV:                | 18.086              |                      |                        |                   |                     |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 31.429                    | 1216.623              | 19.00                   | 6.638              | 385.26               | 25.841                | 413.25            | 0.01597            |
|                                      | STD DEV | 13.034                    | 51.803                | 0.0                     | 2.753              | 16.43                | 9.996                 | 14.59             | 0.00623            |
| TAKEOFF                              | MEAN    | 7.490                     | 8754.512              | 0.70                    | 0.087              | 102.14               | 0.855                 | 169.17            | 0.00052            |
|                                      | STD DEV | 5.447                     | 375.860               | 0.0                     | 0.064              | 4.38                 | 0.629                 | 5.95              | 0.00038            |
| CLIMBOUT                             | MEAN    | 8.892                     | 7336.766              | 2.20                    | 0.326              | 269.01               | 1.214                 | 451.91            | 0.00072            |
|                                      | STD DEV | 4.848                     | 266.697               | 0.0                     | 0.178              | 9.77                 | 0.671                 | 15.92             | 0.00040            |
| APPROACH                             | MEAN    | 18.184                    | 3408.656              | 4.00                    | 1.212              | 227.24               | 5.335                 | 386.67            | 0.00313            |
|                                      | STD DEV | 6.147                     | 167.198               | 0.0                     | 0.410              | 11.15                | 1.758                 | 13.61             | 0.00105            |
| TAXI-IDLE                            | MEAN    | 31.429                    | 1216.623              | 7.00                    | 2.446              | 141.94               | 25.841                | 152.25            | 0.01597            |
|                                      | STD DEV | 13.034                    | 51.803                | 0.0                     | 1.014              | 6.05                 | 9.996                 | 5.36              | 0.00623            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 10.710             | 1125.60              |                       | 1573.25           |                    |
|                                      |         |                           |                       | STD DEV:                | 3.974              | 39.53                |                       | 55.33             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 9.494              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.308              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.775              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 2.372              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.604              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.442              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 5.126                     | 1216.623              | 19.00                   | 1.083              | 385.26               | 4.234                 | 413.25            | 0.00262            |
|                                      | STD DEV | 2.307                     | 51.803                | 0.0                     | 0.487              | 16.43                | 1.903                 | 14.59             | 0.00118            |
| TAKEOFF                              | MEAN    | 0.778                     | 8754.512              | 0.70                    | 0.009              | 102.14               | 0.087                 | 169.17            | 0.00005            |
|                                      | STD DEV | 1.094                     | 375.860               | 0.0                     | 0.013              | 4.38                 | 0.122                 | 5.95              | 0.00007            |
| CLIMBOUT                             | MEAN    | 0.921                     | 7336.766              | 2.20                    | 0.034              | 269.01               | 0.124                 | 451.91            | 0.00007            |
|                                      | STD DEV | 0.994                     | 266.697               | 0.0                     | 0.036              | 9.77                 | 0.134                 | 15.92             | 0.00008            |
| APPROACH                             | MEAN    | 1.753                     | 3408.656              | 4.00                    | 0.117              | 227.24               | 0.515                 | 386.67            | 0.00030            |
|                                      | STD DEV | 0.884                     | 167.198               | 0.0                     | 0.059              | 11.15                | 0.262                 | 13.61             | 0.00015            |
| TAXI-IDLE                            | MEAN    | 5.126                     | 1216.623              | 7.00                    | 0.399              | 141.94               | 4.234                 | 152.25            | 0.00262            |
|                                      | STD DEV | 2.307                     | 51.803                | 0.0                     | 0.180              | 6.05                 | 1.903                 | 5.36              | 0.00118            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 1.641              | 1125.60              |                       | 1573.25           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.720              | 39.53                |                       | 55.33             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 1.461              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.640              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 1.043              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.457              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.613              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.862              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 4.596                     | 1216.623              | 19.00                   | 0.971               | 385.26               | 3.796                 | 413.25            | 0.00235            |
|                                      | STD DEV | 1.524                     | 51.803                | 0.0                     | 0.322               | 16.43                | 1.263                 | 14.59             | 0.00077            |
| TAKEOFF                              | MEAN    | 197.742                   | 8754.512              | 0.70                    | 2.307               | 102.14               | 22.513                | 169.17            | 0.01360            |
|                                      | STD DEV | 35.161                    | 375.860               | 0.0                     | 0.410               | 4.38                 | 3.393                 | 5.95              | 0.00211            |
| CLIMBOUT                             | MEAN    | 131.017                   | 7336.766              | 2.20                    | 4.804               | 269.01               | 17.822                | 451.91            | 0.01061            |
|                                      | STD DEV | 19.775                    | 266.697               | 0.0                     | 0.725               | 9.77                 | 2.333                 | 15.92             | 0.00140            |
| APPROACH                             | MEAN    | 30.850                    | 3408.656              | 4.00                    | 2.057               | 227.24               | 9.055                 | 386.67            | 0.00532            |
|                                      | STD DEV | 4.724                     | 167.198               | 0.0                     | 0.315               | 11.15                | 1.307                 | 13.61             | 0.00081            |
| TAXI-IDLE                            | MEAN    | 4.596                     | 1216.623              | 7.00                    | 0.358               | 141.94               | 3.796                 | 152.25            | 0.00235            |
|                                      | STD DEV | 1.524                     | 51.803                | 0.0                     | 0.119               | 6.05                 | 1.263                 | 5.36              | 0.00077            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 10.496              | 1125.60              |                       | 1573.25           |                    |
|                                      |         |                           |                       | STD DEV:                | 1.547               | 39.53                |                       | 55.33             |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 9.320               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.291               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.662               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.880               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 158.640             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 24.647              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 78.415                    | 2294.865              | 19.00                   | 16.563             | 726.71               | 34.027                | 1483.32           | 0.01120            |
|                                      | STD DEV | 16.204                    | 207.822               | 0.0                     | 3.422              | 65.82                | 5.209                 | 35.13             | 0.00252            |
| TAKEOFF                              | MEAN    | 8.291                     | 17052.313             | 0.70                    | 0.097              | 198.94               | 0.487                 | 520.46            | 0.00019            |
|                                      | STD DEV | 5.363                     | 821.375               | 0.0                     | 0.063              | 9.58                 | 0.320                 | 12.30             | 0.00012            |
| CLIMBOUT                             | MEAN    | 11.741                    | 14316.879             | 2.20                    | 0.430              | 524.95               | 0.823                 | 1390.38           | 0.00031            |
|                                      | STD DEV | 3.670                     | 820.809               | 0.0                     | 0.135              | 30.09                | 0.264                 | 32.86             | 0.00010            |
| APPROACH                             | MEAN    | 32.570                    | 5203.895              | 4.00                    | 2.171              | 346.93               | 6.419                 | 892.22            | 0.00243            |
|                                      | STD DEV | 11.269                    | 468.229               | 0.0                     | 0.751              | 31.21                | 2.808                 | 21.14             | 0.00080            |
| TAXI-IDLE                            | MEAN    | 78.415                    | 2294.865              | 7.00                    | 6.102              | 267.73               | 34.027                | 546.49            | 0.01120            |
|                                      | STD DEV | 16.204                    | 207.822               | 0.0                     | 1.261              | 24.24                | 5.209                 | 12.92             | 0.00252            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 25.363             | 2065.26              |                       | 4832.86           |                    |
|                                      |         |                           |                       | STD DEV:                | 4.698              | 152.07               |                       | 114.19            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 12.258             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.886              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 5.263              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.062              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.218              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.143              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 11.359                    | 2294.865              | 19.00                   | 2.399              | 726.71               | 4.965                 | 1483.32           | 0.00162            |
|                                      | STD DEV | 3.099                     | 207.822               | 0.0                     | 0.655              | 65.82                | 1.304                 | 35.13             | 0.00045            |
| TAKEOFF                              | MEAN    | 2.953                     | 17052.313             | 0.70                    | 0.034              | 198.94               | 0.173                 | 520.46            | 0.00007            |
|                                      | STD DEV | 2.215                     | 821.375               | 0.0                     | 0.026              | 9.58                 | 0.131                 | 12.30             | 0.00005            |
| CLIMBOUT                             | MEAN    | 2.647                     | 14316.879             | 2.20                    | 0.097              | 524.95               | 0.184                 | 1390.38           | 0.00007            |
|                                      | STD DEV | 1.806                     | 820.809               | 0.0                     | 0.066              | 30.09                | 0.127                 | 32.86             | 0.00005            |
| APPROACH                             | MEAN    | 2.997                     | 5203.895              | 4.00                    | 0.200              | 346.93               | 0.590                 | 892.22            | 0.00022            |
|                                      | STD DEV | 1.376                     | 468.229               | 0.0                     | 0.092              | 31.21                | 0.288                 | 21.14             | 0.00010            |
| TAXI-IDLE                            | MEAN    | 11.359                    | 2294.865              | 7.00                    | 0.884              | 267.73               | 4.965                 | 546.49            | 0.00162            |
|                                      | STD DEV | 3.099                     | 207.822               | 0.0                     | 0.241              | 24.24                | 1.304                 | 12.92             | 0.00045            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 3.615              | 2065.26              |                       | 4832.86           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.881              | 152.07               |                       | 114.19            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 1.756              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.431              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 0.749              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.186              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.779              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.587              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 10.323                    | 2294.865              | 19.00                   | 2.180               | 726.71               | 4.535                 | 1483.32           | 0.00147            |
|                                      | STD DEV | 2.594                     | 207.822               | 0.0                     | 0.548               | 65.82                | 1.198                 | 35.13             | 0.00036            |
| TAKEOFF                              | MEAN    | 719.951                   | 17052.313             | 0.70                    | 8.399               | 198.94               | 41.990                | 520.46            | 0.01617            |
|                                      | STD DEV | 151.642                   | 821.375               | 0.0                     | 1.769               | 9.58                 | 7.069                 | 12.30             | 0.00359            |
| CLIMBOUT                             | MEAN    | 458.604                   | 14316.879             | 2.20                    | 16.815              | 524.95               | 31.892                | 1390.38           | 0.01212            |
|                                      | STD DEV | 81.739                    | 820.809               | 0.0                     | 2.997               | 30.09                | 4.201                 | 32.86             | 0.00233            |
| APPROACH                             | MEAN    | 54.101                    | 5203.895              | 4.00                    | 3.607               | 346.93               | 10.457                | 892.22            | 0.00404            |
|                                      | STD DEV | 5.727                     | 468.229               | 0.0                     | 0.382               | 31.21                | 1.323                 | 21.14             | 0.00044            |
| TAXI-IDLE                            | MEAN    | 10.323                    | 2294.865              | 7.00                    | 0.803               | 267.73               | 4.535                 | 546.49            | 0.00147            |
|                                      | STD DEV | 2.594                     | 207.822               | 0.0                     | 0.202               | 24.24                | 1.198                 | 12.92             | 0.00036            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 31.805              | 2065.26              |                       | 4832.86           |                    |
|                                      |         |                           |                       | STD DEV:                | 5.075               | 152.07               |                       | 114.19            |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 15.386              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.952               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.593               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 1.135               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 188.690             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 41.875              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | CO<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB CO /<br>1K LB FUEL | ENERGY<br># TH-HR | LB CO /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 72.437                    | 1088.944              | 19.00                   | 11.469             | 344.83               | 66.737                | 288.80            | 0.03971            |
|                                      | STD DEV | 19.468                    | 30.210                | 0.0                     | 3.082              | 9.55                 | 18.639                | 0.0               | 0.01067            |
| TAKEOFF                              | MEAN    | 14.218                    | 7625.230              | 0.70                    | 0.166              | 88.96                | 1.870                 | 133.00            | 0.00125            |
|                                      | STD DEV | 2.944                     | 150.022               | 0.0                     | 0.034              | 1.75                 | 0.426                 | 0.25              | 0.00026            |
| CLIMBOUT                             | MEAN    | 15.251                    | 6354.934              | 2.20                    | 0.559              | 233.01               | 2.401                 | 355.30            | 0.00157            |
|                                      | STD DEV | 1.804                     | 60.839                | 0.0                     | 0.066              | 2.24                 | 0.298                 | 0.0               | 0.00019            |
| APPROACH                             | MEAN    | 39.068                    | 3051.668              | 4.00                    | 2.605              | 203.44               | 12.868                | 304.00            | 0.00857            |
|                                      | STD DEV | 10.078                    | 123.028               | 0.0                     | 0.672              | 8.21                 | 3.550                 | 0.0               | 0.00221            |
| TAXI-IDLE                            | MEAN    | 72.437                    | 1088.944              | 7.00                    | 4.226              | 127.04               | 66.737                | 106.40            | 0.03971            |
|                                      | STD DEV | 19.468                    | 30.210                | 0.0                     | 1.136              | 3.52                 | 18.639                | 0.06              | 0.01067            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 19.024             | 997.30               |                       | 1187.50           |                    |
|                                      |         |                           |                       | STD DEV:                | 4.775              | 19.84                |                       | 0.0               |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 19.117             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.932              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 16.021             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.021              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 1.455              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.301              |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | HC<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB HC /<br>1K LB FUEL | ENERGY<br># TH-HR | LB HC /<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|--------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 32.473                    | 1088.944              | 19.00                   | 5.142              | 344.83               | 30.000                | 288.80            | 0.01780            |
|                                      | STD DEV | 17.225                    | 30.210                | 0.0                     | 2.727              | 9.55                 | 16.121                | 0.0               | 0.00944            |
| TAKEOFF                              | MEAN    | 0.0                       | 7625.230              | 0.70                    | 0.0                | 88.96                | 0.0                   | 133.00            | 0.0                |
|                                      | STD DEV | 0.0                       | 150.022               | 0.0                     | 0.0                | 1.75                 | 0.0                   | 0.25              | 0.0                |
| CLIMBOUT                             | MEAN    | 0.242                     | 6354.934              | 2.20                    | 0.009              | 233.01               | 0.038                 | 355.30            | 0.00003            |
|                                      | STD DEV | 0.221                     | 60.839                | 0.0                     | 0.009              | 2.24                 | 0.035                 | 0.0               | 0.00002            |
| APPROACH                             | MEAN    | 4.224                     | 3051.668              | 4.00                    | 0.282              | 203.44               | 1.394                 | 304.00            | 0.00093            |
|                                      | STD DEV | 4.447                     | 123.028               | 0.0                     | 0.296              | 8.21                 | 1.451                 | 0.0               | 0.00098            |
| TAXI-IDLE                            | MEAN    | 32.473                    | 1088.944              | 7.00                    | 1.894              | 127.04               | 30.000                | 106.40            | 0.01780            |
|                                      | STD DEV | 17.225                    | 30.210                | 0.0                     | 1.005              | 3.52                 | 16.121                | 0.06              | 0.00944            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 7.326              | 997.30               |                       | 1187.50           |                    |
|                                      |         |                           |                       | STD DEV:                | 4.017              | 19.84                |                       | 0.0               |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 7.372              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 4.055              |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 6.170              |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 3.382              |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 0.0                |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.0                |                      |                       |                   |                    |

| MODE                                 |         | EMISSION<br>RATE<br>LB/HR | FUEL<br>RATE<br>LB/HR | TIME IN<br>MODE<br>MIN. | NOX<br>MASS<br>LBS. | FUEL<br>MASS<br>LBS. | LB NOX/<br>1K LB FUEL | ENERGY<br># TH-HR | LB NOX/<br># TH-HR |
|--------------------------------------|---------|---------------------------|-----------------------|-------------------------|---------------------|----------------------|-----------------------|-------------------|--------------------|
| TAXI-IDLE                            | MEAN    | 2.493                     | 1088.944              | 19.00                   | 0.395               | 344.83               | 2.289                 | 288.80            | 0.00137            |
|                                      | STD DEV | 0.597                     | 30.210                | 0.0                     | 0.094               | 9.55                 | 0.546                 | 0.0               | 0.00033            |
| TAKEOFF                              | MEAN    | 153.012                   | 7625.230              | 0.70                    | 1.785               | 88.96                | 20.081                | 133.00            | 0.01342            |
|                                      | STD DEV | 9.845                     | 150.022               | 0.0                     | 0.115               | 1.75                 | 1.519                 | 0.25              | 0.00086            |
| CLIMBOUT                             | MEAN    | 114.759                   | 6354.934              | 2.20                    | 4.208               | 233.01               | 18.071                | 355.30            | 0.01184            |
|                                      | STD DEV | 13.774                    | 60.839                | 0.0                     | 0.503               | 2.24                 | 2.316                 | 0.0               | 0.00142            |
| APPROACH                             | MEAN    | 30.446                    | 3051.668              | 4.00                    | 2.030               | 203.44               | 9.939                 | 304.00            | 0.00668            |
|                                      | STD DEV | 5.197                     | 123.028               | 0.0                     | 0.346               | 8.21                 | 1.331                 | 0.0               | 0.00114            |
| TAXI-IDLE                            | MEAN    | 2.493                     | 1088.944              | 7.00                    | 0.145               | 127.04               | 2.289                 | 106.40            | 0.00137            |
|                                      | STD DEV | 0.597                     | 30.210                | 0.0                     | 0.035               | 3.52                 | 0.546                 | 0.06              | 0.00033            |
| TOTAL FOR CYCLE                      |         |                           |                       | MEAN:                   | 8.563               | 997.30               |                       | 1187.50           |                    |
|                                      |         |                           |                       | STD DEV:                | 0.910               | 19.84                |                       | 0.0               |                    |
| LBS POLLUTANT/1K LB FUEL/CYCLE       |         |                           |                       | MEAN:                   | 8.575               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.758               |                      |                       |                   |                    |
| LBS POLLUTANT/1K LB TH-HR/CYCLE      |         |                           |                       | MEAN:                   | 7.211               |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 0.766               |                      |                       |                   |                    |
| LBS POLLUTANT/1000K LB TH-HR AT T.O. |         |                           |                       | MEAN:                   | 156.591             |                      |                       |                   |                    |
|                                      |         |                           |                       | STD DEV:                | 10.075              |                      |                       |                   |                    |