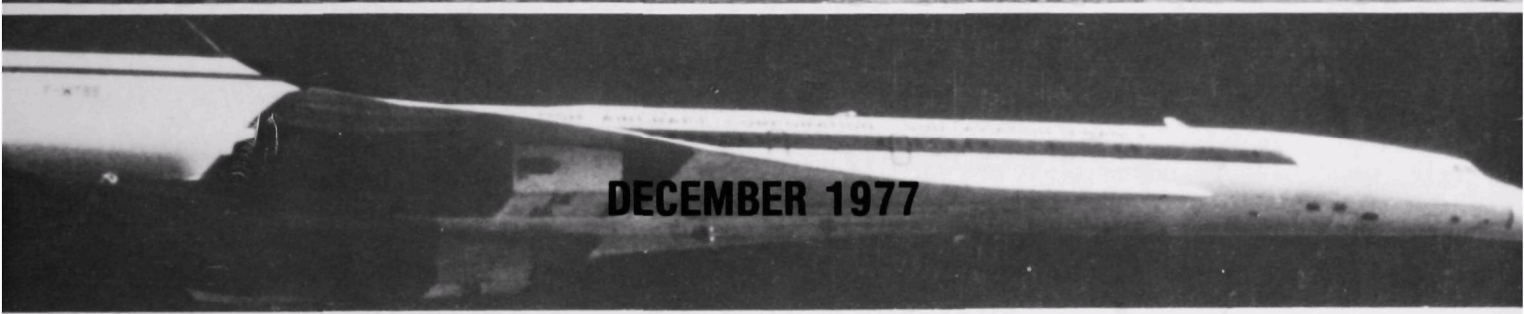
EPA 550/9-78-303

FOREIGN NOISE RESEARCH IN AVIATION



DECEMBER 1977

OFFICE OF NOISE ABATEMENT & CONTROL

U.S. ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

This report has been reviewed by the U.S. Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of commercial products constitute endorsement by the U.S. Government.

FOREIGN NOISE RESEARCH

IN

AVIATION

December 1977

Office of Noise Abatement and Control

U. S. Environmental Protection Agency

Washington, D. C. 20460

PREFACE

Method of Data Collection

The information was collected by means of inquiries to foreign noise contacts, both individuals and organizations. The contacts were queried about their research activities and the names of other individuals or organizations that they were aware of who might be involved in pertinent noise research. These referrals were then contacted to ascertain their research efforts. In addition, inquiries were made at the Ninth International Congress on Acoustics, July 1977. in Madrid, Spain. In total, approximately 1300 requests were made. The foreign researchers were asked to respond with information on their noise abatement research projects that have been completed since January 1976, are in progress, or are planned. They were asked to respond with information about research projects that deal with:

- Aviation noise source control technology
- Surface transportation noise source control technology
- Machinery and construction equipment noise source control technology
- Measurement methodology
- Systems research for noise abatement

The latter two categories include projects not specifically classifiable under aviation, surface transportation, or machinery and construction equipment. "Systems research" includes path modification projects such as noise barriers and operational techniques such as modification of traffic flows.

From these contacts, 116 Aircraft Noise Abatement Research Projects were identified.

Handling of Data

To retain reporting accuracy, where possible, the original responses were included in the report. In the case of foreign language reports, or data not in our format, the information was translated and/or transcribed to a unified format and is identified as having been so treated. Some researchers described their projects to us in a very limited fashion. Therefore, these projects, when listed in this report, show very fragmentary data elements. We did not try to augment these responses, but simply transcribed them verbatim in an abbreviated format at the end of each topical section.

Any funding data that was not reported in U. S. dollars has been converted and the reports show both the reported foreign currency figures in parentheses and the converted U. S. dollars figures. Below is the table of exchange rates used:

Exchange Rates as of Tuesday, June 21, 1977
(Source: The Wall Street Journal)

Argentina-Peso	=	0.00281 US Dollar
Australia-Dollar	=	1.1100 US Dollar
Belgium-Franc	=	0.027715 US Dollar
Canada-Dollar	=	0.9428 US Dollar
Denmark-Krone	=	0.1649 US Dollar

Finland-Markha	=	0.2450 US Dollar
France-Franc	=	0.2024 US Dollar
Japan-Yen	=	0.003671 US Dollar
Netherlands-Franc	=	0.2024 US Dollar
Northern Ireland-Pound	=	1.7196 US Dollar
Norway-Krone	=	0.1884 US Dollar
Poland-Zloty	=	0.0502 US Dollar
Portugal-Escudo	=	0.02590 US Dollar
Scotland-Pound	=	1.7196 US Dollar
Sweden-Krona	=	0.2253 US Dollar
Switzerland-Franc	=	0.3997 US Dollar
United Kingdom-Pound	=	1.7196 US Dollar
West Germany-Mark	=	0.4240 US Dollar

Completeness and Accuracy of Information

Countries or International Organizations Where Researchers Were Contacted

Argentina
Australia
Austria
Belgium
Bulgaria
Canada
Czechoslovakia
Denmark
Finland
France
East Germany
West Germany
Greece
Hungary
International Civil Aviation Organization
Ireland
International Standards Organization
Israel
Italy
Japan
Luxembourg
North Atlantic Treaty Organization
Netherlands
New Zealand
Norway
Organization for Economic Cooperation and Development
Poland
Portugal
Rumania
South Africa
Spain
Sweden
Switzerland
United Kingdom
United Nations
Yugoslovia
Union of Soviet Socialist Republics

In some of these countries we did not receive large numbers of responses. This does not prove conclusively that little or no research is being carried out in these countries. In some cases, we probably never identified the proper contacts. However, it is more likely that a low response rate is an indication that in these areas research is not widespread, with one exception--the USSR, where it is certain that research is being conducted but no response was forthcoming to our inquiries.

While it is impossible to be sure of the accuracy of the reported data, it is likely to be accurate because the data was mostly provided by the researchers themselves, not second or third hand. There is a wide variation in the amount of information reported per project. This probably reflects the varying amounts of time that researchers had available to respond to our inquiries.

The dollar figures given for the research efforts should not be taken too literally because they paint an oversimplifed picture. The buying power of a fixed amount of dollars can vary from country to country due to fluctuating foreign exchange rates. There are also differences between countries in calculating costs of a project, for example, inclusion of overhead rates. The most important factor when considering the funding data is that it is available for only a fraction of the reported projects. This overshadows any other qualifying factors. It is felt that because of these factors, the total funding figures underestimate the total committed resources, but to an unknown degree.

TABLE OF CONTENTS

	Page
Preface	i
Acknowledgements	viii
Introduction	1
Discussion of Foreign Research	
Magnitude of Research Effort	3
Analysis of Research	5
Funding Charts	
Summary Aircraft Noise R&D Funding, 1976-1977	17
Basic Research and Technology Funding, 1976-1977	18
Systems Demonstrations, Propulsion Demonstrations, and Systems Studies Funding, 1976-1977	19
Basic Research and Technology Research Projects	
Propulsion Noise	21
Rotor Noise	45
Interior Noise	53
Airframe Noise	61
Noise Prediction Technology	71
Atmospheric Propagation and Ground Effects	81
Measurement Methodology	85
Architectural Studies	105
Aircraft Other	113

Systems Demonstration, Propulsion Demonstration, and Systems Studies

CTOL (Subsonic) 131

CTOL (Supersonic) 141

Rotorcraft/VTOL 145

General Aviation 151

Country Index of Research Projects 155

ACKNOWLEDGEMENTS

The principal compiler of this report, Robert English, of Informatics Inc, wishes to acknowledge the assistance of Pat Dufour, Miriam Heilman and Carl Modig of Informatics; Harvey Nozick, Roger Heymann and Thomas Quindry of the Office of Noise Abatement and Control; and the hundreds of noise abatement researchers abroad who shared information about their projects. We are especially indebted to Harvey Nozick for the contributions his painstaking review made to the final quality of this report.

INTRODUCTION

Purpose of the Report

This is one of three reports which summarize foreign noise abatement research efforts, based on an appraisal carried out by Informatics Inc for the U. S. Environmental Protection Agency, Office of Noise Abatement and Control, as part of their noise research coordination efforts. The United States Environmental Protection Agency has reconstituted interagency noise research panels covering three areas: aviation, surface transportation, and machinery and construction equipment. The purpose of the panels is to assemble a total picture of U. S. Federally-sponsored noise abatement research recently completed, in progress, or planned, and provide recommendations for additional research which should be performed to meet the goals embodied in the national noise abatement strategy. The three panel reports are scheduled for release in early 1978.

The three reports on research abroad are to supplement the information provided in the panel reports by providing a broad overview of the international research effort underway in noise abatement and control.

Categorization

For this report, Aircraft Noise Abatement Technology Research, the projects were categorized as follows:

Basic Research and Technology

- Propulsion Noise
- Rotor Noise
- Interior Noise
- Airframe Noise
- Noise Prediction Technology
- Atmospheric Propagation and Ground Effects
- Measurement Methodology
- Architectural Studies
- Aircraft Other

Systems Demonstrations, Propulsion Demonstration, and Systems Studies

- CTOL*(Subsonic)
- CTOL (Supersonic)
- Rotorcraft/VTOL**
- General Aviation

* Conventional Take-Off and Landing
** Vertical Take-Off and Landing

DISCUSSION OF FOREIGN RESEARCH

MAGNITUDE OF RESEARCH EFFORT

Reported Research by Country

The following number of projects were reported by country:

United Kingdom	64
Netherlands	26
West Germany	18
Sweden	2
Denmark	2
Canada	2
Norway	1
Northern Ireland	1

Sponsorship of Research

Even though the sponsor was self-identified for only a little more than half of the reported research, it appears that in almost all countries, most of the reported research is government sponsored. West Germany is the only country that shows a level of private sponsorship that is possibly significant.

Type of Research

The type of research was self-identified for less than half of the reported research projects. All of the four types appear to fall at about the same level of effort. The United Kingdom appears to be doing a significant amount of demonstration work and the Netherlands shows a significant level of development work.

Types* of Research by Country

	Fundamental	Development	Demonstration	Measurement & Methodology	Unclassified	
Canada	1				1	
Denmark					2	
Netherlands	1	11	3	3	13	
Northern Ireland	1			1		
Norway					1	
Sweden		1			1	
United Kingdom	7	1	11	3	45	
West Germany	1			1	16	
TOTALS	11	13	14	8	79	125**

*As self-reported by investigators who had the opportunity to classify their projects using one or more of the categories listed in the table.
**The table sums to more than the total number of projects because some projects were classified as more than one type.

Funding Information

Funding tables are provided on pages 17-19. They show funding by country for each major category for the period 1976-1977 and funding by country for each sub-category for the same period.

ANALYSIS OF RESEARCH

BASIC RESEARCH AND TECHNOLOGY

Propulsion Noise

A large amount of research in the area of propulsion noise concerns noise from jets. West German researchers are attempting to determine the distribution of sound sources in turbulent gas jets and the basic mechanisms of jet noise generation by the use of a newly developed measuring device. Studies in the United Kingdom are attempting to locate jet noise sources, to determine forward flight effects on jet noise, and to develop criteria for the design of jet engine silencers based on the structure of jets of differing geometry. Another area of research effort is noise from fans, blowers, and turbines. Canadian research efforts have reduced the noise from rotor/stator interaction in an axial blower by staggering the leading edges of the stator vanes. They have achieved a noise reduction of as much as 15 dBA at the blade pass frequency. Projects in United Kingdom and West Germany are addressing basic noise generating mechanisms of ducted fans, turbine blowers, and compressors. A large number of research projects are being conducted by Rolls Royce in the United Kingdom. They are concerned with such topics as the silencing of inverted velocity profile coannular jets, the study of coaxial jet noise, tests of a silencer nozzle ejector system and an assessment of in-flight and static noise levels of in-service engines. The National Gas Turbine Establishment in the United Kingdom is also conducting a large research effort into aircraft powerplant noise. They are concerned with the characteristics of coaxial jet noise, the

effects of flight on exhaust noise, the improvement of methods for the estimation of broadband noise and interaction tone levels of fans, and studies of reactive sound absorber properties. Researchers in the Netherlands are looking to engine disposition and engine aerodynamic design for noise reduction and are attempting to reduce ground run up noise of test aircraft by noise damping and protective devices. Also of note are projects in the United Kingdom that are assessing the cost, life span, and effectiveness of retrofit hush kits and are attempting to demonstrate the technology for quieting future engines, including quieter versions of existing engines.

Rotor Noise

Reported research in this area is confined to the United Kingdom and West Germany. Projects in the United Kingdom are concerned with the effects of forward speed on the impulsive content of helicopter noise and with high speed rotor and tail rotor noise. West German research deals with designing propeller driven aircraft for noise reduction and with the determination of the essential parameters of disturbed flow from rotors and its effects on the radiated noise.

Interior Noise

All of the reported research projects in this area come from Westland Helicopters Ltd. in the United Kingdom. They have focussed on the gearbox as the primary source of interior noise in helicopters. The research deals with determining the transmission paths of internal cabin noise in Lynx helicopters from excitation at the gearbox feet.

Also, an evaluation is being made of the noise and vibration transmitted through acoustically and vibrationally treated and untreated helicopter panels. Various treatments such as damping materials, "lump wall" concepts, vibration isolation, conventional soundproofing materials, constrained and unconstrained layers, and sandwich constructions are being considered. The effect on interior noise of coating the gearbox with damping material is also under study.

Airframe Noise

A considerable amount of effort is being applied to airframe noise in the United Kingdom. The British have a major program under way to demonstrate uniform noise shielding with the aim of a noise reduction of up to 6 dBA. The Royal Aircraft Establishment is developing analytical methods for predicting the effects on noise propagation of noise shielding by airborne components. They are also doing wind tunnel model and in-flight research on wing and flap vortices from VC10 and Lockheed Tri-Star aircraft. The Institute of Sound and Vibration Research is looking into jet surface interaction and the sound causing capacity of the dissipation of turbulence. West German efforts are directed toward frequencies in ultrasonic radiation that encounters obstacles, such as wing flaps being hit by the blast of airplane propulsion.

Noise Prediction Technology

Researchers in the United Kingdom and the Netherlands are looking at various aspects of this category. The British are developing rigs to produce mixing jet noise with a "minimum of contamination" and designing scale model engine simulators (ejector-powered nacelles) to act as noise sources for shielding and propagation tests. British efforts

are also directed at developing a model to predict noise from inviscid flows and a computer model of a starting jet. Efforts in the Netherlands are underway to develop a computer model that will aid in the development of zoning around airports.

Atmospheric Propagation and Ground Effects

Only one project was identified in this category. It deals with efforts in the United Kingdom to study noise propagation, including the effects of meterological conditions, ground reflection and absorption, and non-linear effects.

Measurement Methodology

Researchers in many countries, including Denmark, the Netherlands, Northern Ireland, and the United Kingdom, are setting up measurement systems to monitor noise around airports of all types; international, secondary, small, and military. Other research in Denmark is attempting to replace the current CNR method of calculating air traffic noise with a system utilizing dBA as a measurement unit and considering the duration of noise emissions. Efforts in the United Kingdom are directed toward the development and testing of anechoic wind tunnels for testing jet mixing noise, airframe noise, and vortex refraction effects. British researchers are also attempting to provide a national primary calibration of standard reference microphones and a national reference service on acoustical measurements. Research in the Netherlands hopes to develop standard methods for the measurement of aircraft noise and to set up a measurement system on runways to aid in their design, placement, and operation.

Architectural Studies

Research in the United Kingdom is looking at the airborne sound insulation of panels by active damping. The results show measured velocity dampings of 40 dBA within the first three or four cycles of an impulsed plate. They see their work as applicable to aircraft as well as frame buildings. Four projects in the Netherlands sponsored by the Interdevelopmental Commission for Reducing Noise in Air Traffic Routes deal with noise insulation of residences and buildings from aircraft noise. They are attempting to survey the literature, evaluate various insulation materials, and determine which are useful in different conditions. They are especially interested in ventilation, thermal, and condensation effects. Their efforts will also consider a survey into the effectiveness of noise insulation regulations. Both existing buildings and future construction will be considered.

Aircraft Other

This category is a mixture of many different types of research. A common area of research in the Netherlands, Sweden, and West Germany are attempts to develop noise protection zones around both civilian and military airports. West German researchers are in the process of compiling a survey of aviation noise related research in West Germany and will evaluate the general status of German research in this area. Efforts in Norway and the United Kingdom are applied to basic aeroacoustic noise generating mechanisms such as two-stream mixing and boundary effects. Researchers in the United Kingdom

are also trying to study the acoustical fatigue resistance and response of titanium in order to assess its potential as a structural component in airplanes and spacecraft. Swedish research efforts are also directed toward the measurement and computation of sonic boom carpets for single and twin engined propeller aircraft.

SYSTEMS DEMONSTRATION, PROPULSION DEMONSTRATION, AND SYSTEMS STUDIES

CTOL (Subsonic)

Reported research in this area came from the Netherlands, West Germany, and the United Kingdom. A major area of concern is the modification of flight procedures in order to reduce noise emissions. Procedures under study include low power-low drag flight operations, reduced flap approaches, two segment approaches, and steeper takeoff and landing flight paths. Also being considered are noise reducing starting procedures, night time jet restrictions, runway alternations, and noise routing of aircraft. These methods are being assessed on the basis of their noise reducing capacity, flight safety considerations, air traffic control consequences, and operational-economic repercussions.

CTOL(Supersonic)

Only one project was identified in this area. It deals with West German research into the possibilities of sonic-boom adjusted designs for supersonic aircraft.

Rotorcraft/VTOL

Research in this category is concerned with flight procedures for VTOL aircraft that will reduce noise. Various takeoff and landing flight paths and atmospheric conditions are being analyzed in West Germany in order to determine the size and shape of noise screening areas around a VTOL landing field.

General Aviation

Two projects were reported in this category and both are from the Netherlands. They are attempting to inventory the state of general aviation noise abatement technology both at present and in the near future, look at the regulations to be set up in the near future, and assess the possibilities of reducing noise by noise damping equipment. They are studying benefits of special rules of use to cover concerns such as advertising and sport flights, flight instructions, and certain noisy types of aircraft.

SUMMARY

The great majority of reported research falls in the area of Basic Research and Technology. Of the total 116 reported projects, 103 are in this category with only 13 in the Systems Demonstrations, Propulsion Demonstration, and Systems Studies area. Within the Basic Research and Technology area, the largest research effort appears to be in the area of Propulsion Noise (28 projects). Two other categories with significant levels of effort are Measurement Methodology (19 projects) and Aircraft Other (21 projects). All other categories show a much lower level of effort.

Of the types of sources considered, general aviation, with two projects, is receiving the least attention. Rotorcraft and propeller driven aircraft are being studied in 14 projects and the majority of the remainder deal specifically with jet noise.

Several projects stand out as significant efforts, as showing significant results, or as having no U. S. research counterparts; and therefore deserve a second mentioning. A project being carried out by the National Research Council of Canada is looking into the rotor/stator interaction in axial blowers. They have achieved a noise reduction of 15 dBA at the blade pass frequency by staggering the leading edges of the stator vanes. A large effort is underway at Rolls Royce Ltd. in the United Kingdom. They are studying many aspects of jet noise and are utilizing theoretical, experimental, and in-flight techniques. The National Gas Turbine Establishment of the United Kingdom also has a major effort underway to look at aircraft powerplant noise. In the area of helicopter noise control, Westland Helicopters Ltd. of the United Kingdom is carring out many projects. They are concerned with interior noise due to gearbox vibrations, the effects of forward speed on the impulsive content of helicopter noise, and high speed rotor and tail rotor noise. Another significant British effort is a project by Hawker Siddeley Aviation Ltd. that is attempting to demonstrate the realities of airborne noise shielding and is aiming at a 6 dBA reduction.

A significant effort in West Germany is being sponsored by the German Research Society and is considering the frequency spectrum of ultrasonic radiation which encounters obstacles. This is an important consideration when wing flaps are being hit by the blast of airplane propulsion exhaust. The Max-Planck Institute in West Germany is conducting a questionnaire survey of all aviation noise-related research in the Federal Republic of Germany. This survey will include an expert analysis of the general status of German research in this area. The Institute for Flight Technology of Darmstadt Technical Institute in West Germany is conducing a study concerned with optimum takeoff and landing flight paths for VTOL planes. They are also attempting to determine the necessary shape and size of a noise screening area around a VTOL landing field based on the yearly traffic volume and differing atmospheric conditions.

Several projects are being sponsored by the Interdevelopmental Commission for Reducing Noise in Air Traffic Routes of the Netherlands. They are attempting to insulate residences and other buildings from aircraft noise. They are especially interested in ventilation, thermal, and condensation effects as they apply to the various noise insulation materials.

FUNDING CHARTS

SUMMARY
AIRCRAFT NOISE R & D FUNDING
IN THOUSANDS
1976-1977

*Some funding for other years included because project extended longer than 1976-1977.

Converted to thousands of U.S. Dollars.

CATEGORY	Canada	Denmark	Netherlands	Northern Ireland	Sweden	United Kingdom	West Germany	TOTALS	Projects with Funding Reported
	COUNTRY								
Basic Research and Technology	94	56	265	14	30*	726*	1406*	2591*	30 of 103
Systems Demonstrations, Propulsion Demonstration, and Systems Studies			68				127*	195*	3 of 13
TOTALS	94	56	333	14	30*	726*	1533*	2786*	33 of 116

BASIC RESEARCH AND TECHNOLOGY
FUNDING IN THOUSANDS
1976-1977

*Some funding for other years included because projects extended longer than 1976-1977.

Converted to thousands of U.S. Dollars.

CATEGORY	COUNTRY								
	Canada	Denmark	Netherlands	Northern Ireland	Sweden	United Kingdom	West Germany	TOTALS	Projects with Funding Reported
Propulsion Noise	94					66*	112*	272*	4 of 28
Rotor Noise						338*	433*	771*	3 of 6
Interior Noise						119*		119*	5 of 5
Airframe Noise						103	131*	234*	2 of 10
Noise Prediction Technology			99			45*		144*	2 of 8
Atmospheric Propagation and Ground Effects								0	0 of 1
Measurement Methodology		56	136	14		54*	678*	938*	9 of 17
Architectural Studies						1		1	1 of 5
Aircraft Other			30		30*		52*	112*	4 of 23
TOTALS	94	56	265	14	30*	726*	1406*	2591*	30 of 103

SYSTEMS DEMONSTRATIONS,
PROPULSION DEMONSTRATION, AND
SYSTEMS STUDIES NOISE R & D FUNDING
IN THOUSANDS
1976-1977

*Some funding for other years included because project extended longer than 1976-1977.

Converted to thousands of U.S. Dollars.

CATEGORY	COUNTRY: Netherlands	West Germany	TOTALS	Projects with Funding Reported
CTOL (Subsonic)	68		68	2 of 7
CTOL (Supersonic)		127*	127*	1 of 1
Rotorcraft (VTOL)				0 of 3
General Aviation				0 of 2
TOTALS	68	127*	195*	3 of 13

BASIC RESEARCH AND TECHNOLOGY

PROPULSION NOISE

See Also Pages:

64
67
74
75
76
79
80
94
99
103
127

Project Title:

Noise Reduction in Axial Blowers

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
National Research Council Canada Division of Physics Ottowa, Canada KIA OR6	
Principal Investigator(s): T.F.W. Embleton	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): ($50,000) $47,140. 1977 (budget): ($50,000) $47,140. 1978 (forecast): ($50,000) $47,140. Or Total Funding Amount: COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

This is a terminating project that has demonstrated, on model scale in the Division of Physics, that the rotor/stator interaction noise of an axial blower can be reduced by staggering the leading edges of the stator vanes. This can be achieved with numerous variations of stagger in either the axial or circumferential directions. In most cases there is a small reduction in mechanical efficiency: in one particular design there is a marginal increase in efficiency. Noise reduction at the blade passage frequency is as much as 15 dB, depending on the number of vanes, their shape and other factors.

One particular design of stator vane having an axial stagger has been selected for testing at higher shaft speeds and blade loading in the Division of Mechanical Engineering. This design was selected primarily for its compatibility with current aero-engine design practice and was not expected to provide the optimum blend of noise reduction and mechanical efficiency. Measurements at several rotor speeds between 6000 and 12000 rpm show that the fundamental and second harmonic of the blade passage frequency are in general reduced in level by 5 to 10 decibels with occasional extreme values of 0 and 15 decibels for particular combinations of rotor speed, mass flow and direction of measurement. These noise reductions confirm the findings, at lower rotor speeds, in the Division of Physics. The measured aerodynamic performance of the staggered stator vanes is similar to that of standard straight-edged vanes for most degrees of choking of the flow. However, the stalling pressures for the staggered vanes are usually a few percent lower than for the standard vanes. When these measurements have been fully analyzed a report will be issued by the Engine Laboratory of Mechanical Engineering Division.

Transcribed from the original.

Project Title:

Jet Noise Control

Performing Organization Name & Address:

Dept. of Transport Technology
Loughborough University of Technology
Loughborough
Leics, LE11 3TU
United Kingdom

Sponsoring Organization Name & Address:

Science Research Council
State House
High Holborn
London, WC1 R 4TA

Principal Investigator(s):

E. R. Bergstrom
Dr. M. V. Lowson

Type of Research Program:

X Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: July 1, 1973

Completion Date:
Estimated Oct. 31, 1978
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(£19,416) $33,388

COMMENTS: No work completed during period 30/9/75-1/11/76 due to lack of research personnel

To develop criteria for the design of jet engine silencers from the comparative analysis of the noise radiation and turbulence structure of jets of differing geometry.
The reduction of noise radiated by jet aircraft has been a matter of prime concern for many years. The problem is exemplified by Concorde, where jet noise levels have proven a major operational embarrassment. But even for quiet engines such as the RB211 jet noise retains its importance. Advances in technology have allowed jet exhaust speeds to be reduced with consequent U^8 law reduction in the noise radiated by the free jet. Developments in acoustic lining techniques enable internal noise sources to be substantially reduced. But the free jet noise radiation continues to provide a limit below which silencing of internal noise sources becomes valueless. Thus methods of free jet noise control retain a fundamental significance for the overall reduction of engine noise.
The academic problems posed by jet noise are also of extreme interest. The mathematical description of the noise contains many subtleties. Combining this with the necessary description of the turbulent structure in the jet poses a theoretical problem which will probably never be solved exactly, except possibly by some hypercomputational technique.

Transcribed from the original.

Project Title:

Noise Radiated by Ducted Fans

Performing Organization Name & Address:

Loughborough University of Technology
Department of Transport Technology
Loughborough
Leicestershire LE11 3JU
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

J. B. Ollerhead
C. E. Whitefield

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: April 1974

Completion Date:
Estimated March 1977
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount: (£10,000-25,000)	$17,196-42,990

COMMENTS:

The effects of the cowl on the noise radiation of an aircraft fan are being studied experimentally. The fan, approximately 6m in diameter, absorbs up to 50kw running at tip speeds up to 150 m/s. It is installed inside a large anechoic chamber with provision to exhaust the flow from the chamber. Hot-wire anemometers are installed in the leading edge of fan blades to measure inlet turbulence. The rig is instrumented for thrust and torque measurements. Noise measurements will be correlated with inlet conditions over a range of fan r.p.m. and thrust.

Transcribed from the original.

Project Title:

Noise Radiation by Rotating Blading

Performing Organization Name & Address:

Loughborough University of Technology
Loughborough
Leics. LELL 3TU
England

Sponsoring Organization Name & Address:

Ministry of Defence
(National Gas Turbine Establishment)

Principal Investigator(s):

J. B. Ollerhead
Department of Transport Technology

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Apr. 1, 1974

Completion Date:
Estimated March 30, 1978
Actual _____

Funding:

Year	Amount	
1976 (actual):	(£7908)	$13,599
1977 (budget):	(£10886)	$18,720
1978 (forecast):		

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

This project is a continuation of work funded by N.G.T.E. since 1971 into basic noise generating mechanisms of rotating machinery. The earlier work involved an evaluation of rotor noise theory via direct measurement of an "aero-acoustic transfer function", using rotating hot-wire probes at fan tip speeds up to M = 0.2. For an open rotor, good agreement was found between theory and experiment for both random and periodic noise components.

The study has now been extended to a higher speed range by the construction of a new stand to test an aircraft ducted fan unit at tip speeds up to M = 0.5. Rotating hot-wires are again being used to investigate basic noise generation mechanisms.

Project Title: Study of the Distribution of Sound Sources in Turbulent Gas Jets

Performing Organization Name & Address:

Institute for Fluid Mechanics of the DFVLR
Goettingen, Bunsenstr. 10
West Germany

Sponsoring Organization Name & Address:

Principal Investigator(s):

Dr. Grosche

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
May 1, 1972	Estimated _____ Actual Dec. 31, 1976

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(264,000 DM) $111,936

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Up to now very little is known about the distribution of sound sources in turbulent jets, either experimentally or theoretical; the project aims at determining the distribution of sound sources in infrasound and ultrasound beams by means of a newly developed measuring device, and thereby to gain new insights on the mechanism of jet generation. The measuring device is also suitable in sound-abating nozzle configuration, nozzle flaps, etc.

Publications

Grosche, F. R., Holst, H.; On the Distribution of Sound Source Intensity in Turbulent Gas Jets.

Grosche, F. R.; Jones T. H.; Withold, G.A.; Measurements of the Distribution of Sound Intensities in Turbulent Jets.

Translated and transcribed from the original German.

Project Title:
Noise Formation and Noise Reduction for Turbine Stages with Cool Air Directed onto the Turbine Guide Blades

Performing Organization Name & Address:
The Technical Institute for Jet Propulsion and Turbomachinery of the Technical University of Aachen
Templergraben 55
Aachen, West Germany

Sponsoring Organization Name & Address:
German Research Society

Principal Investigator(s):
Prof. Dipl. Ing. Otto David

Type of Research Program:
_x_ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Jan. 1, 1976

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount: (300,000 DM) $127,200.

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Within the framework of the research intent, the results of the study of noise origin mechanisms from blowers and compressers are to be applied to the case of use of the turbine with blowing out of cool air. It is the purpose of the plan to determine design criteria for the selection of blowing out of cool air in the case of cooled turbine stages which contribute to a noise reduction of turbines.

Translated and transcribed from the original German.

Project Title:

Study of Axial Flow Fan Aeroacoustics

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
National Research Council of Canada Division of Mechanical Engineering Ottawa, Canada	In-house research

Principal Investigator(s):	Type of Research Program:
G. Krishnappa	X Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology

Start Date:	Completion Date: Estimated 1978 Actual ____
1973	

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	1 man year
1977 (budget):	½ man year
1978 (forecast):	½ man year

Or Total Funding Amount:

COMMENTS:

Basic research is being carried out to establish the relative importance of the rotor blade row and stator blade row on fan noise generation. Some measurements on the effect of stator blade number and spacing on the in-duct noise signatures were completed and the results are published in Reference 1. Far field noise on different stator blade configuration were also recently measured and the results will be reported in a later publication.

The concept of stepped stator blades was recently tested both for aerodynamic performance and noise reduction. The test results demonstrate that the stepped stator blades has considerable merit with respect to noise reduction with some loss in aerodynamic performance.

REFERENCES

1. G. Krishnappa — Fan Aeroacoustics, the Effect of Stator Blade Number and Spacing on In-Duct Noise Signatures
Progress in Aeronautics, Vol. 44, 1976

2. U.W. Schaub, G. Krishnappa — The Stepped Stator Concept: Aerodynamic and Acoustic Performance Evaluation of a Thrust Fan
under publication as an AIAA paper

Project Title:
Study of the Possibilities of Aviation-Technical Innovations to Reduce the Noise Emission of Aircraft

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Department of Economics Amsterdam, Netherlands	Interdepartmental Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: __x__ Fundamental __x__ Development (Component or System) ____ Demonstration (Experimental, Prototype, or Production) ____ Measurement Methodology
Start Date: 1976 est. / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

Fundamentally, we are dealing here with the possibilities with the use of quiet-engine technology by means of configuration optimization (especially with regard to engine disposition) and aerodynamic design to arrive at a minimum noise production with possible future aircraft designs of the national aircraft industry. Adaption of the results should eventually take place in a later stage within the framework of a developmental project in the area of style technology.

Translated and transcribed from the original Dutch.

Project Title: Preliminary Study of the Forward Speed Effects of Turbomachinery Tones

Performing Organization Name & Address:
British Aircraft Corporation Ltd.
Commercial Aircraft Division
Brooklands Road
Weybridge
Surrey KT13 OSF, United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

P. R. Kearsey, M. S. Langley

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In a recent study of airframe noise, level flyover at various engine powers were recorded. At 1/3-octave frequencies above 1 kHz the turbomachinery tones dominated the total spectra. When these 1/3-octave levels were compared with the ground running measurements at similar power settings and corrected to the same distance, very poor agreement was obtained. It is proposed to study the narrow band-levels of each tone and its harmonics inflight and statically with a view to the determination of the forward speed effect.
It is hoped that this preliminary study will lead to a further more detailed research programme.

Transcribed from the original.

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
ROLLS-ROYCE LTD., DERBY, ENGLAND	H. M. GOVERNMENT MOD (PE)

Principal Investigator(s):

Mr. A. M. Cargill

Type of Research Program:

___ Fundamental
___ Development (Component or System)
_X_ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
	Estimated _____
	Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In co-operation with SNECMA an experimental programme has been conducted on the silencing effects of inverted velocity profile coannular jets. This programme has given considerable insight into the manner in which such silencing is achieved and so far suggests the likely benefits are small.

AIAA PAPER 77-1263 "The Noise Characteristics of Inverted Velocity Profile Coannular Jets"
by A. M. Cargill and J. P. Duponchel
To presented at the 4th AIAA Aero-acoustic Specialists conference Atlanta Georgia in October, 1977

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
ROLLS-ROYCE LTD., DERBY, ENGLAND	H. M. GOVERNMENT MOD (PE)
Principal Investigator(s): Mr. A. CARGILL	Type of Research Program: X Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: Completion Date: Estimated _____ Actual _____	Funding: Year — Amount 1976 (actual): 1977 (budget): 1978 (forecast): - Or Total Funding Amount: - COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

In co-operation with the National Gas Turbine Establishment a fundamental programme of tests of coaxial jet noise is being carried out (at NGTE Pyestock, Hants, England) to extend the range of velocities ($>$ 1200fps) and scale (3.4" dia. prim.) of available data. This programme in total is also intended to provide a better understanding of coaxial jet noise.

Project Title:

Jet Noise Source Location

Performing Organization Name & Address:

Southampton University
Institute of Sound & Vibration Research
Southampton SO9 5NH
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

S. A. Glegg
M. J. Fisher

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Publications

"Source location on the RB-211 engine." S. Glegg and M. J. Fisher 1976 University of Southampton, ISVR Contract Report No. 76/3.
"Developments and applications of polar correlation." S. Glegg 1976 University of Southampton, ISVR Contract Report No. 76/30.
"Jet noise source location: the Polar Correlation Technique." M. J. Fisher, M. Harper Bourne and S. Glegg 1977 Journal of Sound and Vibration 51. 23-54.

Transcribed from the original.

Project Title:

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aircraft Establishment Farnborough Hampshire GU14 6TD United Kingdom	
Principal Investigator(s): J. McKie	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

Tests on the influence of angle of incidence between a jet and an external stream on the production of jet noise have shown that a measurable interaction, creating additional noise, exists and could be important in the understanding of jet noise mechanisms and in the correction from static to forward speed conditions.

Reference

J. B. W. Edwards
J. McKie "Measurements of the noise of a jet at incidence to a freestream." RAE Technical Memorandum Aero 1705 ARG 37222 (Jan. 77).

Transcribed from the original.

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
ROLLS-ROYCE LTD., DERBY, ENGLAND.	H. M. GOVERNMENT MOD (PE)
Principal Investigator(s): Mr. W. SMITH	Type of Research Program: ___ Fundamental ___ Development (Component or System) _X_ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: Completion Date: Estimated _____ Actual _____	Funding: Year — Amount 1976 (actual): 1977 (budget): 1978 (forecast): - Or Total Funding Amount: - COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

In co-operation with Douglas Aircraft Company Limited, of Long Beach, California, an investigation has been made of the performance, both static and inflight on the "Spinning Rig" model jet facility, of a silencer nozzle ejector system. These tests have shown that such devices are effective inflight.

Project Title:

Aircraft Powerplant Noise Research

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
National Gas Turbine Establishment Pyestock Farnborough, Hampshire GU14 OLS United Kingdom	
Principal Investigator(s): M Cox, W D Bryce, D L Martlew	Type of Research Program: _X_ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Research is centred in the Anechoic and Absorber facilities of the Noise test facility[1]. In the Anechoic facility, programmes of research involving close collaboration with industry are run on turbines and exhaust jets. The characteristics of coaxial jet noise have been examined extensively, and the results of this research have been contributed to the SAE A-21 Noise sub-committee. Work on the use of co-flowing streams to simulate the effect of flight has shown that the method is valid at relatively small ratios of outer to inner stream diameter. A paper will be delivered to the AIAA Conference October 1977 on this subject.

Studies of the effect of flight on exhaust noise[2] have been a principal activity and the effect of flight on internally-generated noise radiated from the exhaust duct has been measured and good agreement with theory has been demonstrated[4]. The effect of flight on shock-associated noise in jets has also been measured and the results will be published at the AIAA Aero-acoustics conference October 1977.

Tests on various model fans have been run in collaboration with Rolls-Royce to improve methods of estimating broadband noise and interaction tone levels[3]. A method of eliminating unwanted tones arising from inflow distortions on tests on static engines and rigs using a honeycomb screen has shown good results. These will be the subject of a paper at the AIAA conference October 1977.

Tests to measure the properties of reactive sound absorbers are run in the Absorber facility; one series of tests was a joint activity with the Boeing Company[6]. A method of measuring directly the local behaviour of liners has been developed, and has been used in research on the effect of high sound level and airflow on the impedance of silencer elements.

Publications (see separate sheet)

Publications

1 The design, construction and operation of the noise test facility at the National Gas Turbine Establishment
D L Martlew, J M Hawkins, R L Brooking, A S Kennedy
Aeronautical Journal of the Royal Aeronautical Society, January 1976

2 The prediction of flight effects on jet noise
B J Cocking
AIAA Paper No 76-555, July 1976

3 A study of factors affecting the broadband noise of high speed fans
R B Ginder, D R Newby
AIAA Paper No 76-567, July 1976

4 The radiation of plane-wave duct noise from a jet exhaust, statically and in flight
R A Pinker, W D Bryce
AIAA Paper No 76-581, July 1976

5 Engine noise - a look ahead
M Cox, D R Higton
Aeronautical Journal of the Royal Aeronautical Society, November 1976

6 Experimental verification of a finite length tuning concept for acoustic lining design
J F Unruh (Boeing), I R Price
Journal of Sound & Vibration, Vol 49, No 3, December 1976

Project Title:
Aircraft Engine Noise

Performing Organization Name & Address:

ROLLS-ROYCE
DERBY
ENGLAND

Sponsoring Organization Name & Address:

H. M. GOVERNMENT MOD (PE)

Principal Investigator(s):

Mr. D. Newby
Dr. B. Stratford

Type of Research Program:

_X_ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Some investigations have been carried out on Fan buzz-saw noise and resulted in better understanding of the underlying source and propagation, leading to a more precise control technique to reduce selected engine orders.

AIAA PAPER 77-1343 "A New Look at the Generation of Buzz-saw Noise" by B. S. Stratford and D. R. Newby To be presented at the 4th AIAA Aero-acoustic Specialists Conference at Atlanta Georgia in October, 1977

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:

ROLLS-ROYCE LTD.,
DERBY,
ENGLAND.

Sponsoring Organization Name & Address:

H. M. GOVERNMENT MOD (PE)

Principal Investigator(s):

J. Chapman

Type of Research Program:

___ Fundamental
___ Development (Component or System)
_X_ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

A test programme extending the range of data from model turbines and investigating the effects of vane numbers and blade/vane spacings on noise has been carried out in the anechoic facility at NGTE Pyestock. The analysis of this data is giving rise to more sophisticated design rules for quiet turbines.

Project Title:

Reduction of Propulsion Noise

Performing Organization Name & Address:

German-French Research Institute
St. Louis (ISL)
Rue de L'Industrie 12, Weil am Rhein
West Germany

Sponsoring Organization Name & Address:

Principal Investigator(s):

Dr. Rudi Schall

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Jan. 1, 1972

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Study to reduce the noise of a jet. Study concerning the mechanism of noise origin with cold and hot free jets with the purpose of reducing jet noise of an airplane or other free jet equipment (e.g. welding torch). Theoretical and experimental works on free jets reduced in size according to model. Studies on the propagation of noise of high intensity. Use of rapid, measuring methods not disturbing the jets (laser anemometry, etc.).

Translated and transcribed from the original German.

Netherlands. Study into the Possibilities and Consequences of Noise-Damping and Protective Devices for Ground Run-up. Air Traffic Service, Amsterdam, Netherlands. Sponsor: Interdepartmental Commission for Reduction of Noise Over Air Traffic Routes. Type: Demonstration. 1976 est. The purpose of this study is to come up with useable solutions in concrete problem situations (for example, Schiphol) in limiting the noise of test aircraft and airplane motors. Primarily, attention should be paid to solutions applied in other situations at home and abroad.

United Kingdom. Aircraft Engine Noise. Rolls-Royce Ltd., Derby, England. Sponsor: H. M. Government MOD (PE). Mr. A. Syed. Type: Demonstration. Noise source location is being applied to in service engines to re-define jet and core noise level, and assist with extrapolation to farfield.

United Kingdom. Aircraft Engine Noise. Rolls-Royce Ltd., Derby, England. H. M. Government MOD (PE). Mr. V. Szewczyk. Mr. R. Healey. Type: Demonstration. Flight and static jet noise assessments are being carried out on several in service engines, (RB211, M45H, Spey and Viper,) covering effects on both straight jet and high by-pass ratio types.

United Kingdom. Turbulence Measurements in Connection with Jet Noise Source Location Work. Southampton University. Institute of Sound & Vibration Research, Southampton S09 5NH, United Kingdom. B. Edwards.

United Kingdom. Forward Flight Effects on Jet Noise (Co-operative Work with Lockheed-Georgia Company). Southampton University, Institute of Sound & Vibration Research, Southampton S09 5NH, United Kingdom. C. L. Morfey. Publication: "Effects of forward velocity on turbulent jet mixing noise." H. E. Plumblee (Editor) 1976 NASA CR-2702.

United Kingdom. Retrofit-Aircraft. U. K. Noise Advisory Council, London, United Kingdom. Assessment of the evidence available on the cost of fitting hush-kits, the likely remaining life span of the aircraft involved, and the benefit in terms of reduced noise emission.

United Kingdom. Research on Quieting Engines and Air Frames. Royal Aircraft Establishment, National Gas Turbine Establishment, Farnborough, Hampshire, United Kingdom. These programs are aimed at demonstrating the technology which could be applied to future engines, including quieter versions of the M4SH and RB-211 engines.

United Kingdom. The Role of Flow-Acoustic Interaction Effects in Jet Noise. Southampton University, Institute of Sound & Vibration Research, Southampton S09 5NH, United Kingdom. M. J. Fisher, C. L. Morfey, V. M. Szewczyk.

West Germany. Study and Reduction of Noise Generation by Engine Components. Chair for Flight Propulsion of Munich, Tech. Univ., Munich 2, Arcisstr. 21, West Germany. Dr. Dittrich. January 1, 1972-December 31, 1977. Comparison of the various individual noise generating mechanisms. Boundary layer noises, flight technology, overland express transportation technology.

West Germany. Research on Noise Generation by Encased Propellers as a Function of their Design Parameters. Institute for Jet Propulsion and Turbo Machinery, Aachen, Templeryraben 55, West Germany. Prof. Dipl. - Eng. Otto David.

BASIC RESEARCH AND TECHNOLOGY

ROTOR NOISE

See Also Pages:

23
25
26
29
39
40
43
148

Project Title:
Theoretical Studies and High Speed Flight Tests

Performing Organization Name & Address:
Westland Helicopters Limited
Yeovil
Somerset BA 20 2YB
United Kingdom

Sponsoring Organization Name & Address:
MINISTRY OF DEFENCE (PE)

Principal Investigator(s):
J. W. LEVERTON

Type of Research Program:
___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: FEB. 76

Completion Date:
Estimated MAY 78
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount: (£36,280)	$62,387

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

To determine the effect of forward speed on the impulsive noise content of a helicopter by both theoretical and experimental studies. The motivation behind the study lies in the fact that very little is known either experimentally or theoretically about forward flight effects. The available experimental data suggests that helicopter noise rises with forward speed, the rise being particularly steep at higher speeds. In a military context this increase in noise implies an increase in detectability, whilst in the civil context it may lead to an undesirable limitation on cruise speed in noise sensitive areas.

Project Title:

Helicopter Noise Control

Performing Organization Name & Address:

WESTLAND HELICOPTERS LIMITED
YEOVIL
SOMERSET, BA 202 YB
UNITED KINGDOM

Sponsoring Organization Name & Address:

M.o.D.(PE)

Principal Investigator(s):

J. LEVERTON

Type of Research Program:

X Fundamental
X Development (Component or System)
X Demonstration (Experimental, Prototype, or Production)
X Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year		Amount	
1976	(actual):	(£80,000)	$137,568.
1977	(budget):	(£80,000)	$137,568.
1978	(forecast):	(£80,000)	$137,568.

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

A series of projects are in process on aspects of helicopter noise control under both MoD and internal funding. Areas of special interest include

High Speed Rotor Noise

Tail Rotor Noise

Subjective Response to Helicopter Noise

Internal Noise Control

Gear Noise

Project Title:
Noise Reduction in Propulsion of Propeller Driven Airplanes

Performing Organization Name & Address:
Dornier Corp.
Friedrichshafen, Post Fach 317
West Germany

Sponsoring Organization Name & Address:
Federal Highway Ministry
(Swiss) Confederate Air Office
Flight Equipment Section

Principal Investigator(s):
Peter Bartels

Type of Research Program:
___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
Nov. 1, 1973	Estimated _____ Actual Dec. 31, 1976

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(1,022,000 DM) $433,328

COMMENTS:

Side-by-side with the limited noise abatement in existing planes of commercial aviation, it is the aim of this project to develop knowledge which will make it possible to hold down noise emission in propeller planes as much as possible by guiding their construction right from the earliest design stage. In addition to the study of propeller noise, centering on measured output of 100-200 p.s., computational and experimental studies are also carried out on exhaust noise abatement.

Transcribed from the original German.

Project Title:

Performing Organization Name & Address:
Royal Aircraft Establishment
Farnborough
Hampshire GU14 6TD
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

J. Williams

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

RAE participation in UK discussions on aircraft noise certification now relates primarily to appraisals of the interaction between airfield-performance characteristics and noise-certification procedures for fixed-wing aircraft, of acceptable noise-certification techniques for helicopters, and of economic penalities for technically feasible noise reductions below existing ICAO requirements. Work has started on evaluating the influence of operational procedures on helicopter noise, together with studies of the main and tail noise-generation processes.

Transcribed from the original.

Project Title:
Relation between the Noise Generated by Rotors and the Defined Disturbance in the Air Flow.

Performing Organization Name & Address:

The Faculty for Aeronautical and Space Studies of the Technical University of Aachen
Templergraben 55
West Germany

Sponsoring Organization Name & Address:

Principal Investigator(s):

Prof. Dr.-Ing. Dieter Geropp

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Jan. 1, 1976

Completion Date:
Estimated Dec. 31, 1977
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Plan: Dependence of noise generation due to rotary engines on defined disturbances in air flow. The purpose of the planned studies is to determine the essential parameters of disturbed flow and of rotors on the radiated noise. They are to proceed on the basis of the noise source, and this is to be studied in detail. This includes the measurement of pressure fluctuations on the rotor surface to determine the strength of the sound source (dipole).

Transcribed and translated from the original German.

Project Title:
Noise Reduction for Propeller Driven Aircraft

Performing Organization Name & Address:
Rainier, Ltd.
Friedrichshafen, West Germany

Sponsoring Organization Name & Address:
Federal Ministry of Defense

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:
1973

Completion Date:
Estimated _____
Actual 1976

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Transcribed from the original.

BASIC RESEARCH AND TECHNOLOGY

INTERIOR NOISE

See Also Page:

107

Project Title:

Vibration Transmission Paths Study

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Westland Helicopters Limited Yeovil Somerset, BA 20 2YB United Kingdom	MINISTRY OF DEFENCE (PE)
Principal Investigator(s): C. R. WILLS	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: APR. 75 Completion Date: Estimated _____ Actual JUNE 76	Funding: Year — Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: (£2,400) $4,127 COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Published, June 1976. Vibration Transmission Paths. Author C. R. Wills Westland Helicopters Limited. Research Paper 523.

Measurements have been made of the structural responses of the Lynx helicopter airframe and the resulting internal cabin noise when excited at the gearbox feet and by loud-speakers housed in the cabin.

The airframe was subjected to both single frequency and swept frequency inputs via a vibrator attached the port forward and starboard aft gearbox feet in turn. Similar acoustic excitation to that for the vibration tests was also provided by two loud speakers mounted in the opposite corners of the cabin on the floor. The resulting airframe response was subsequently measured at the numerous accelerometer positions on the cabin roof, floor, sidewalls and main frames together with the gearbox mounting feet, Microphones were also positioned in the cabin/cockpit area in order to monitor the cabin noise environment.

Project Title:

Noise and Vibration Survey During Flight

Performing Organization Name & Address:

Westland Helicopters Limited
Yeovil
Somerset, BA 20 2YB
United Kingdom

Sponsoring Organization Name & Address:

MOD (PE)

Principal Investigator(s):

J. S. POLLARD

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: FEB. 1976

Completion Date:
Estimated NOV. 1977
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(£13,250) $22,785

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

To determine the relative contributions of structural borne noise and airborne noise by conducting a detailed noise and vibration survey of the gearbox and cabin structures in flight. The flight test results will be correlated with the ground based data from the Rotor Rig. The noise and vibration characteristics of a footed gearbox will also be compared with those of a gimbal mounted gearbox.

Project Title: Helicopter Cabin Noise Laboratory Evaluation of Vibrating Panel Treatments

Performing Organization Name & Address:
Westland Helicopters Limited
Yeovil
Somerset BA 20 2YB
United Kingdom

Sponsoring Organization Name & Address:

MINISTRY OF DEFENCE (PE)

Principal Investigator(s):

J. S. POLLARD

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: APR. 77

Completion Date: Estimated JUNE 1979
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(£19,810) $34,065

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

It is proposed to conduct a laboratory evaluation of the response of vibrating panel treatments. This investigation will be conducted in the anechoic/reverberation facility and will involve the measurement of the noise and vibration transmitted through acoustically and vibrationally treated and untreated panels which are acoustically and/or structurally excited. In addition to testing panels with conventional soundproofing materials, the use of damping treatments, lump wall concepts and new methods of vibration isolation will be studied. Also the stringer/invetting arrangement of the bare panels will be varied and new panels will be made using sandwiche construction, composite materials and constrained/unconstrained layers. The experimental work will be backed up with theoretical studies using models developed from classical wave theory, so that comparisons can be made with measured data.

Project Title:

Internal Noise Study on Rotor Rig

Performing Organization Name & Address:

Westland Helicopters Limited
Yeovil
Somerset BA 20 2YB
United Kingdom

Sponsoring Organization Name & Address:

MINISTRY OF DEFENCE (PE)

Principal Investigator(s):

J. S. POLLARD

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: FEB. 76

Completion Date: Estimated NOV. 77
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount: (£24,020) $41,305

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

To assist in the development of an effective helicopter soundproofing scheme, it is neccessary to determine the noise and vibration input paths to the cabin structure, and if possible, the radiation efficiency of the structure. An experimental investigation is therefore taking place on the Lynx Rotor Rig, which is essentially a tied down non-flying Lynx helicopter, to (a) survey noise and vibration levels of the gearbox and cabin structures, (b) study the effect of coating the gearbox with damping material and (c) conduct a cabin soundproofing study.

Project Title:
Internal Noise Study-Noise Vibration Monitoring on Gearbox Rigs

Performing Organization Name & Address:

WESTLAND HELICOPTERS LIMITED
Yeovil, Somerset BA. 202YB
United Kingdom

Sponsoring Organization Name & Address:

MINISTRY OF DEFENCE (PE)

Principal Investigator(s):

M. C. A. WOODWARD
J. S. POLLARD

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: FEB. 76

Completion Date:
Estimated FEB. 79
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(£9,765) $16,792

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

A number of Lynx and Sea King helicopter gearboxes are being monitored. In order to have comparative records it has been necessary to standardise the procedure by mounting the accelerometers at similar positions on each gearbox and conducting the measurements at similar operating conditions. It is hoped to show how design changes influence the noise aspects of gearboxes and the scatter between identical gearboxes will also be studied. Early measurements have indicated there could be a large variation in noise levels between identical gearboxes.

BASIC RESEARCH AND TECHNOLOGY

AIRFRAME NOISE

See Also Pages:

30
31
76
94
107
128

Project Title:

Performing Organization Name & Address:

Hawker Siddeley Aviation Ltd.
Aerodynamics & Noise Research
Richmond Road
Kingston upon Thames
Surrey, United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1973

Completion Date:
Estimated 1977
Actual _____

Funding:

Year	Amount	
1976 (actual):	(£40,000)	$68,784
1977 (budget):	(£20,000)	$34,392
1978 (forecast):		
Or Total Funding Amount:	(£170,000)	$292,332

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

During 1976 and so far 1977, we have been completing a major programme of flight research which started in 1973. This programme is to demonstrate the realities of airframe noise shielding which are aimed at reducing noise by up to 6 dB.

Transcribed from the original.

Project Title:

Interference in Ultrasonic Radiation

Performing Organization Name & Address:

Chair for Air and Space Travel
Aachen View
Aachen Templeigraben 55
West Germany

Sponsoring Organization Name & Address:

German Research Society

Principal Investigator(s):

Prof. Dr. -Ing. Rolf Staufenbiel

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
Jan. 1, 1974	Estimated ____ Actual Dec. 31, 1976

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount: (310,000 DM) $131,440

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

The occurence of discrete frequencies in the sound spectrum of ultrasonic radiations which encounter obstacles is to be studied. This causes noise that is much louder than the familiar "shock-cell-noise". This type of sound generation can occur in rocket and vertical airplane blast-off or when wing flaps are hit by the blast of the airplane propulsion. Anechoic chambers are used to measure directional characteristics of the sound field, sound output levels and narrow-band frequency spectrums of the sound field. Sound waves and macroscopic as well as microscopic turbulence are made visible by special schlieren processes.

Translated and transcribed from the original German.

Project Title:

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aircraft Establishment Farnborough Hampshire GU14 6TD United Kingdom	
Principal Investigator(s): E. G. Broadbent	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

Work has continued on the further development of analytical methods for the prediction of aircraft noise propagation with the effects of noise shielding by the airframe components and their associated flow fields included. Forward-speed effects on exhaust noise can be important and a good deal of light has been shed on this and related problems by the use of a transformation due to K. Taylor, RAE. The transformation has proven valuable in both scattering problems and in source-type problems, where there is a uniform stream present in the far field. Vortex refraction work has also continued and a simplified prediction method is being developed.

Transcribed from the original.

Project Title:

Performing Organization Name & Address:
Royal Aircraft Establishment
Farnborough
Hampshire GU14 6TD
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

T. A. Holbeche

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Theoretical and experimental work continues on the assessment of the noise generated by airflow over the airframe components and its relation to the total noise field of the aircraft. Flight experiments with a VC 10 and Lockheed TriStar have now been analysed to provide information on the noise directivity and on the variation of noise level with changes of configuration and speed. Consideration is being given to model tests in the RAE 24 ft acoustic wind-tunnel using a directional microphone technique to discriminate against tunnel background noise.

Reference

P. Fethney "An experimental study of airframe self-noise." Progress in Astronautics and Aeronautics Vol 45, pp 379-403 (1976).

Transcribed from the original.

Project Title:

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aircraft Establishment Farnborough Hampshire GU14 6TD United Kingdom	
Principal Investigator(s): T. A. Holbeche	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): - Or Total Funding Amount: - COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

The analyses of the flight studies of airframe shielding effects reported last year are largely complete. Further flight investigations of airframe shielding, flow field, and engine installation effects on noise propagation are planned. The properties of the acoustic radiation from a large turbofan engine have also been investigated. Preliminary analysis of flight and tunnel experiments with swept wing aircraft to study flow field effects on engine noise propagation have revealed significant noise redistribution effects associated with the wing and flap vortices and more detailed examination of the results is under way.

References

R. W. Jeffery
T. A. Holbeche "Experimental studies of noise-shielding effects for a delta-winged aircraft." Progress in Astronautics and Aeronuatics Vol 45, pp 419-440 (1976).

Transcribed from the original.

Project Title:
Vortex Refraction

Performing Organization Name & Address:
British Aircraft Corporation Ltd.
Commercial Aircraft Division
Brooklands Road
Weybridge, Surrey KT13 OSF
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

P. R. Kearsey
M. S. Langley

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Work carried out by BAC and NGTE has indicated that the velocity field induced by wing shed vortices can significantly reduce the noise radiated from engines.
RAE Farnborough have recently supplied us with a copy of a three- dimensional vortex refraction programme capable of assessing the above effects.
In order to evaluate its potential as a prediction method it is proposed to compare results from this programme with test data already accumulated by BAC. Any necessary modifications to the computer program will be made if it is felt that the prediction techniques employed can be improved upon.
It is envisaged that work will also be carried out to assess the relative importance of wing and flap shed vortices.

Transcribed from the original.

Project Title:

Structural Response Under Turbulent Flow Excitations

Performing Organization Name & Address:
Institute of Sound and Vibration Research
The University
Southampton, SO95NH
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

Y. K. Lin

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In this report three problems of turbulent-induced random vibration are discussed. The first two problems, an airplane flying into atmospheric turbulence and a panel exposed to boundary-layer pressure fluctuations, are treated as linear problems. If Taylor's hypothesis of a frozen turbulence field is valid then the calculation can be greatly simplified using a spectral analysis in the wave-number domain. Furthermore, even if decay in the turbulence is appreciable a superposition scheme can still be used which retains many of the advantages of the above approach.
The third problem, the response of a building to gusty wind, is formulated as a nonlinear problem in which random inputs occur both as parametric and non-parametric excitations. The stochastic averaging method of Stratonovich and Khasminskii is used to obtain equivalent Ito equations for along-wind and cross-wind motions, and stablity conditions are established.

Transcribed from the original.

United Kingdom. Untitled project on jet-surface interactions. Royal Aircraft Establishment, Farnborough, Hampshire GU14 6TD, United Kingdom. J. McKie. Experiments in the RAE 24 ft. tunnel to investigate the generation of noise caused by jet-surface interactions under static and forward speed conditions have been continued using a representation of a wing-plus-flap as the interfering surface.

United Kingdom. Jet/Surface Interaction Noise. Southampton University, Institute of Sound & Vibration Research, Southampton SO9 5NH, United Kingdom. R. W. Head, M. J. Fisher. Publication "Jet surface interaction noise: Analysis of low frequency augmentations of jet noise due to the presence of a solid shield." R. W. Head and M. J. Fisher 1976 AIAA Paper No. 76-502.

United Kingdom. Turbulent Dissipation as a Source of Sound. Southampton University, Institute of Sound & Vibration Research, Southampton SO9 5NH, United Kingdom. C. J. Morfey. Project completed. Publication "Sound radiation due to unsteady dissipation in turbulent flows." C. L. Morfey 1976 Journal of Sound and Vibration 48, 95-111.

BASIC RESEARCH AND TECHNOLOGY

NOISE PREDICTION TECHNOLOGY

See Also Pages:

24
27
33
34
36
37
65
67
68
69
94
102
103
115
130
134

Project Title: Studies Involving the Zoning Legislation and Developing a Computer Model

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976

Completion Date: Estimated 1980 / Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount	
1976 (actual):	(200,000 F)	$40,480
1977 (budget):	(250,000 F)	$50,600
1978 (forecast):	(150,000 F)	$30,360
1979 "	(150,000 F)	$30,360
1980 "	(150,000 F)	$30,360

Or Total Funding Amount:

COMMENTS:

Explanation: In 1976, the "modification to the aviation law" was supposed to become law. The zoning around airports were regulated with this. Diverse activities were expected in connection with this. Attention was especially to be paid to setting up a regulation in which the calculation method was to be clearly laid down for noise pollution around air fields. A further development of the computation model to determine noise hindrance was also to be expected in 1976.

In later years, emphasis was to be laid on collecting data needed for noise hindrance determination. This was supposed to be dependent to a large degree on the introduction and the use of a MLS-guidance system and making other future changes in the procedure.

Translated and transcribed from the original Dutch.

Project Title:

The Effect of Forward Speed on Jet Noise

Performing Organization Name & Address:

Department of Aeronautics & Astronautics
University of Southampton
Southampton
United Kingdom

Sponsoring Organization Name & Address:

Science Research Council
State House
Kingsway London
United Kingdom

Principal Investigator(s):

Prof. I. C. Cheeseman
B. Pritchard

Type of Research Program:

X Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
1976	Estimated 1978 Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount: (~~£~~26000) $44,710.

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

A rig to produce mixing jet noise with minimum contamination has been developed and tested in the anechoic wind tunnel. Jet velocities up to 300 m/s have been used and forward flight simulated up to 30 m/s. Preliminary results have shown that in the static case the noise generated by the jet corresponds to the results obtained by P. Lush. The effect of forward speed has been to produce a change in field shape and noise level even at very low forward speeds. The effect of yawing the jet has also been examined and significant changes found. These results are now being examined in depth.

Transcribed from the original.

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:

ROLLS-ROYCE LTD.,
DERBY,
ENGLAND.

Sponsoring Organization Name & Address:

H.M. GOVERNMENT MOD (PE)

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
_X_ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

The "Spinning Rig" facility has been developed to reduce aerodynamic and acoustic uncertainties. Repeatability is now excellent and although the measurement environment is still suspect ($\pm$ 1dB error) and facility still produces some 3dB excess above hot model jet noise.

Noise Prediction Technology
United Kingdom

Project Title:

Performing Organization Name & Address:

Royal Aircraft Establishment
Farnborough
Hampshire GU14 6TD
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

J. McKie

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

An investigation has been made of the possibilities of using a model-scale engine simulator (an ejector-powered nacelle) to act as a noise source for acoustic tunnel tests of shielding and propagation. A number of further schemes are being examined to provide representative jet noise sources together with internal noise sources with realistic spectra and tonal content, to simulate the exhaust noise of a full scale high-bypass-ratio engine.

Transcribed from the original.

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:

ROLLS-ROYCE LTD.,
DERBY,
ENGLAND.

Sponsoring Organization Name & Address:

H. M. GOVERNMENT MOD (PE)

Principal Investigator(s):

Dr. B. W. Lowrie
Mr. D. Newby

Type of Research Program:

___ Fundamental
___ Development (Component or System)
_X_ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	

COMMENTS:

An intake which should allow inflight noise levels to be observed from a fan on static test has been developed, and calibrated and the work described in

AIAA PAPER 77-1323 "The Design and Calibration of a Distortion-Reducing Screen for Fan Noise Testing" by Dr. B. W. Lowrie and Mr. D. Newby To be presented to the 4th Aero-acoustics Specialists Conference at Atlanta Georgia in October, 1977.

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:

ROLLS-ROYCE LTD.,
DERBY,
ENGLAND

Sponsoring Organization Name & Address:

H. M. GOVERNMENT MOD (PE)

Principal Investigator(s):

Dr. B. W. Lowrie

Type of Research Program:

___ Fundamental
___ Development (Component or System)
X Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In conjunction with outside consultants a technique to determine the model structure of aero engine noise is being developed for held measurements. Progress so far has indicated that it should be possible and the work is reported in:

AIAA PAPER 77-1331 "Farfield Method of Duct Mode Detection for Broadband Noise Sources"
By Dr. B. W. Lowrie, B. J. Tester and C. L. Morfey.
To be presented to the 4th AIAA Aero-acoustics Specialists Conference at Atlanta Georgia in October, 1977.

Project Title:

Coherent Structure in Jet Turbulence

Performing Organization Name & Address:

Southampton University
Institute of Sound & Vibration Research
Southampton SO9 5NH
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

P. O. A. L. Davies
D. R. J. Baxter
P. J. McConachie

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Publication

"A computer simulation of a starting-jet." A. V. J. Edwards, C. L. Morfey and P.O.A.L. Davies 1977 University of Southampton, ISVR Technical Report No. 89.

A discrete vortex model of an axisymmetric starting jet, originally proposed by T E Base and P O A L Davies, (T E Base 1969 Mathematical Studies of Vortex Models to Represent Unsteady Flow. PhD thesis, Southampton University) is refined, attention being given to small scale aspects of the model flow as well as to grosser features. Some attempt at the simulation of some real flow characteristics is made and comparison with experiment is considered.

Transcribed from the original.

Project Title:
Jet Noise Prediction from Inviscid Flow Models

Performing Organization Name & Address:

Southampton University
Institute of Sound & Vibration Research
Southampton SO9 5NH
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

P.O.A.L. Davies
C. L. Morfey
A.V.J. Edwards

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Transcribed from the original.

BASIC RESEARCH AND TECHNOLOGY

ATMOSPHERIC PROPAGATION AND GROUND EFFECTS

See Also Pages:

99
117

Project Title:

Propagation of Sound in the Atmosphere

Performing Organization Name & Address:

National Physical Laboratory
Teddington
Middlesex
United Kingdom

Sponsoring Organization Name & Address:

Dept. of Industry
1 Victoria Street
London SW1
United Kingdom

Ministry of Defense
(Procurement Executive)
Nat'l Gas Turbine Est.
Pyestock Hampshire
United Kingdom

Principal Investigator(s):
Dr. D. W. Robinson
Dr. M. E. Delany
Dr. D. F. Pernet
R. C. Payne

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Studies of propagation, including effects of meteorological conditions, ground reflection and absorption, and non-linear effects, with particular reference to the noise from aircraft.

Publications

"The amplitude disturbances of non-linear signals", D. F. Pernet and R. C. Payne, NPL Acoustics Report Ac 70, 1975.
"Sound absorption in air at frequencies up to 100 KHz", E. N. Bazley, NPL Acoustics Report Ac 74, 1976.
"The prediction of noise levels L_{10} due to road traffic", M. E. Delany, D. G. Harland, R. A. Hood and W. E. Scholes, Journal of Sound and Vibrations, 48, 3, 305-325, 1976.

Transcribed from the original.

BASIC RESEARCH AND TECHNOLOGY

MEASUREMENT METHODOLOGY

See Also Pages:

25
26
64
66
73
130

Project Title:

Movable Monitoring System, Verification of Calculation Method.

Performing Organization Name & Address:
National Agency of Environmental Protection
Kampmannsgade 1
1604 Kobenhaven
Denmark

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1977

Completion Date:
Estimated 1978
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget): (300.000 D.kr.)	$49,470
1978 (forecast): (50.000 D.kr.)	8,245

Or Total Funding Amount:

COMMENTS:

Movable Monitoring System, Verification of Calculation Method:

The reliability of a number of noise calculations performed in major airports have been questioned by the local authorities. The National Agency of Environmental Protection admits that the theoretical calculations rest on a simplified basis, and therefore finds it appropriate to perform a number of noise measurements at selected localities around major airports in order to verify the theoretical calculations.

Transcribed from the original.

Project Title:
Guidelines on the Calculation and Evaluation of Air Traffic Noise.

Performing Organization Name & Address:
National Agency of Environmental Protection
Kampmannsgade 1
1604 Kobenhaven
Denmark

Sponsoring Organization Name & Address:

Principal Investigator(s):

National Agency of Environmental Protection

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:
Aut. 1977

Completion Date:
Estimated Spring 1978
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	(37.000 D.kr) $6,101
1978 (forecast):	(30.000 D.kr) 4,947

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Guidelines on the Calculation and Evaluation of Air Traffic Noise:

An existing working group has agreed that the current method to calculate air traffic noise (CNR-method) shall be replaced by a method in which dB(A) is used as a measurement unit and the duration of the noise emission is considered. The new method will be introduced in connection with renewed noise calculations for Kastrup/Saltholm Airport, under the auspices of the "Airport Committee of 1975". The Acoustic Laboratory will assist the Agency of Environmental Protection in the provision of the technical guideline basis.

Transcribed from the original.

Project Title:

Working Up and Analysis of Noise Measuring Recordings

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976

Completion Date: Estimated 1980 / Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount	
1976 (actual):	(100,000 F)	$20,240
1977 (budget):	(55,000 F)	$11,132
1978 (forecast):	(60,000 F)	$12,144
1979 "	(65,000 F)	$13,156
1980 "	(75,000 F)	$15,180

Or Total Funding Amount:

COMMENTS:

Purpose: Control of noise hindrance calculations and development of future noise guarding system.

Explanation: In 1975, the NLR was involved in working up recordings of RLD noise measurement. On the one hand, this included the setting up of so-called monthly and quarterly reports and calculating programs, that is to say the manual method which up to today has been customary with the RLD, while besides this the purpose was to build up a set of recordings which makes it possible to have a statistical analysis of strong fluctuations in the measured noise level.

In 1975, after the program for the named report had already come, in 1975, the regular production of reports was supposed to be taken care of by the NLR. On the basis of the preliminary test carried out in 1975 as to the possible causes of occurring fluctuations, work was to be done on a wider scale in 1976.

Translated and transcribed from the original Dutch.

Project Title: Measurements on Runways

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1977

Completion Date:
Estimated 1981
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount	
1977 (actual):	(140,000 F)	$28,336
1978 (budget):	(90,000 F)	$18,216
1979 (forecast):	(45,000 F)	$ 9,108
1980	(50,000 F)	$10,120
1981	(50,000 F)	$10,120

Or Total Funding Amount:

COMMENTS:

Purpose: Development of methods for runway definition, collecting data, i.e. noise hindrance calculations and control of the performance of flight procedures.

Explanation: The development of an improved method of recording the digitalized radar data of TAR 2 advanced to a satisfactory measure in 1976. Because the delivery of the needed magnetic tape recorders shall take place right at the start of 1977, operational use should be made of the new recording apparatus which will take some more time. In expectation of this, use should be made of the recording system with cassettes.

In 1977, the program should be expanded in order to produce the desired runways as efficiently and rapidly as possible.

Just as in the preceding years, in 1977 measurements should be made on aircraft starting from and landing on the Schiphol airport by the NLR. If possible, attention should be paid to the aircraft starting from and landing on the runways of the Rotterdam airport.

In addition, to control the carrying out of the flight procedures, the recorded flight paths should be treated to obtain data with reference to noise prevention calculations such as determining the spread in runways and laying instructional circuits.

In the years after 1977, a limited further optimization will be anticipated of the measuring method and the pertinent working out of programs and continuing the measurements.

Translated and transcribed from the original Dutch.

Project Title:

Preventing Noise Caused By Aircraft

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976

Completion Date:
Estimated 1980
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount	
1976 (actual):	(175,000 F)	$35,420
1977 (budget):	(200,000 F)	$40,480
1978 (forecast):	(225,000 F)	$45,540
1979	(250,000 F)	$50,600
1980	(275,000 F)	$55,660
1981	(275,000 F)	$55,660

COMMENTS:

Explanation and time phasing:

In 1976, calculations are to be carried out concerning noise hindrance around:

- Schiphol,
- secondary airports, such as Zestienhoven, Beek, Eelde,
- small airports, such as Teuge

The calculations are to be carried out for the present day situation (i.e. 1975) as well as for future situations. If so indicated, calculations should also be carried out on a quarterly basis for the Schiphol airport.

These calculations should also be necessary in the coming years, possibly in adapted form.

Translated and transcribed from the original Dutch.

Project Title:

Noise Spectra for the Environs of Belfast Airport.

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Department of Aeronautical Engineering, Queen's University, David Keir Building, Belfast BT9 5AG, Northern Ireland.	None
Principal Investigator(s): Professor P.P.Benham Dr. S.Raghunathan	Type of Research Program: X Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) X Measurement Methodology
Start Date: Oct.1976 Completion Date: Estimated Dec. 1977 Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: (£8000) $13,757
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	COMMENTS:

Belfast airport is not very large (not international status) and is situated about 15 miles from the city. It receives however a very wide range of aircraft types, private and commercial and there is an adjacent small military unit. There is an interest from local environmentalists and aeronautical industry to establish the landing, take-off and overhead noise spectra of a range of aircraft at various stations in the environs of the airport.

The department of Aeronautical Engineering, has undertaken this project and a preliminary report will be prepared in October 1977 and a final report in about one year hence.

Project Title:

Aircraft Noise Measurement Programme

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Dept. of Engineering University of Reading Reading, Berks United Kingdom	Various local authorities to the west of London Airport (Heathrow) and close to Gatwick Airport.
Principal Investigator(s): Dr. A. J. Pretlove	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) _X_ Measurement Methodology
Start Date: 1969 Completion Date: Estimated Ongoing Actual _____	Funding: Year / Amount 1976 (actual): (£800) $1376 1977 (budget): (£800) $1376 1978 (forecast): (£000) $1720 Or Total Funding Amount: COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

The aim of the work is to provide a continuing monitor of aircraft noise levels close to Heathrow and Gatwick airports so that trends may be observed and, if necessary, representations made to the U.K. government. All measurements have been made using the Noise and Number Index based on continuous measurements in dBA. Various trends have been observed in the eight years of the running of the programme and these have been tentatively explained in terms of the changing pattern of aircraft types and numbers of movements. No reports have been prepared for public circulation but information is available on request.

Transcribed from the original.

Project Title:

Development of Closed Working Section Anechoic Wind Tunnel

Performing Organization Name & Address:

Department of Aeronautics & Astronautics
University of Southampton
Southampton
United Kingdom

Sponsoring Organization Name & Address:

Science Research Council
State House
Kingsway
London
United Kingdom

Principal Investigator(s):
Prof. I. C. Cheeseman
B. Pritchard

Type of Research Program:

___ Fundamental
___ Development (Component or System)
X Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1973

Completion Date:
Estimated ____
Actual 1976

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(£30,000) $51,588

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

An existing 7'x5' closed section wind tunnel has been coverted to have anechoic properties for frequencies above 500 Hz. Specially constructed splitters have been developed to reduce the noise generated by the wind tunnel fan. Due to the need to retain the original aerodynamic capability the splitters have had to be placed in the high speed diffuser where they create a 40% blockage and generate aerodynamic noise which tends to dominate the noise levels in the working section measured with a single microphone is roughly flat above 500 Hz at a level of 58 dB. The use of correlation techniques has further reduced this level.
Initial experiments carried out during the commissioning of the tunnel demonstrated that jet mixing noise, airframe noise and vortex refraction effects can be satisfactorily measured.

Transcribed from the original.

Project Title:
Production of Noise Protection Maps

Performing Organization Name & Address:
Institute for Applied Geodesy
Richard-Strauss-Alle 11
Frankfort
West Germany

Sponsoring Organization Name & Address:

Principal Investigator(s):

Dr.-Ing. Walter Satzinger

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
Jan. 1, 1973	Estimated Dec. 31, 1980 Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(1,600,000 DM) $678,400.

COMMENTS:

The production of maps for noise protection zones for civilian and military airports, as a part of the compliance with the regulation issued under the Aviation Noise Control Act of March 30, 1971.

Translated and transcribed from the original German.

Project Title: Development of a Standard Measuring Procedure for Aircraft Noise

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Air Service Public Health & Environmental Hygiene Amsterdam, Netherlands	Interdepartmental Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1976 est. Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

A standard measuring procedure needs to be available for aircraft noise on behalf of noise supervision in general as well as for individual aircraft movements. Such a method is being worked on at the present time on the basis of international recommendations. Further developments with possible differentiation of various forms of air traffic are desirable in the future.

As much as possible, use needs to be made of already developed procedures in the framework of studies made earlier.

Translated and transcribed from the original Dutch.

Project Title:

Study of the Design of a Noise Guard System

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aviation Service, Defense Public Health & Environmental Hygiene Dept. Amsterdam, Netherlands	Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1976 est. Completion Date: Estimated _____ Actual _____	Funding: Year — Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	COMMENTS:

The purpose of this study is to set up data and guidelines for the design of a noise defense system around air flight territories. A distinction is made between large international aircraft areas, regional civilian aircraft territories, military aircraft territories and small civilian air flight territories. In close deliberation with the responsible authorities, a specification should be drawn up of the noise prevention system for different types of aircraft terrain. On the basis of this, the design of the system should be worked out as to apparatus, use, calibration, and procedures to be worked out for establishing an interpretation of informations sources.
In this working out, attention needs to be paid to stationary and mobile noise measuring posts and possible other equipment. Consideration also needs to be given to the location of measuring posts, setting up of equipment to determine atmospheric influences.

Translated and transcribed from the original Dutch.

Project Title: Development of a Standard Calculation Method for Noise Pollution Caused by Airplanes

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Air Service Defense, Public Health and Environmental Hygiene Department Amsterdam, Netherlands	Interdepartmental Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1976 est. Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

For the benefit of noise zoning around air flight terrain, such as expected in the legal draft modifying the law of aviation, it is necessary in connection with the involved legal consequences that the calculation of noise curves be done according to a standard method. Guidelines should be taken up for acceptance with regard to flight parameters, aircraft parameters, atmospheric and geomorphological factors, the distribution of flight movements and the compilation of the air corps as well as with regard to acoustical factors which are used for the calculations.

Translated and transcribed from the original Dutch.

Project Title:

Effects of Microphone Height on Aircraft Noise Measurements

Performing Organization Name & Address:
British Aircraft Corporation Ltd.
Commercial Aircraft Division
Brooklands Road
Weybridge, Surrey, KT13 OSF
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

P. R. Kearsey, M. S. Langley

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

In aircraft flyover noise measurements it is rarely possible to locate the microphone in a position where the effects of the ground plane are insignificant. In order to investigate and minimize these effects it is proposed to study noise data obtained from measurements taken with microphones at various heights and above various ground covers. It is envisaged that noise tests will be made on a modern aircraft with high bypass ratio engine (Lockheed Tristar). Results will then be representative of the aircraft engines which are likely to be in service in the foreseeable future. This work will be particularly relevant to certain revisions of noise certification which are currently being proposed.

Transcribed from the original.

Project Title:

National Calibration Standards for Sound Pressure and Noise Measurement

Performing Organization Name & Address:

National Physical Laboratory
Teddington
Middlesex
United Kingdom

Sponsoring Organization Name & Address:

Dept. of Industry
1 Victoria Street
London SW1
United Kingdom

Dept. of Trade
The Adelphi
John Adam Street
London WC1, United Kingdom

Principal Investigator(s):

Dr. D. W. Robinson
Dr. M. E. Delany
E. N. Bazley

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

To provide primary calibration of standard reference microphones and a national reference service on acoustical measurement. International comparisons. Standards for noise emission measurement, especially aircraft.

Publications

"Sound absorption in air at frequencies up to 100 KHz", E. N. Bazley, NPL Acoustics Report Ac 74, 1976.

"Calibration procedures for sound level meters to be used for measurements of industrial noise", M. E. Delany, L. S. Whittle, K. M. Collins, and K. S. Fancey, NPL Acoustics Report Ac 75, 1976.

"The effect of small variations in the height of a microphone above ground surface on the measurement of aircraft noise", D. F. Pernet and R. C. Payne, NPL Acoustics Report Ac 77, 1976.

Transcribed from the original.

Project Title:

Performing Organization Name & Address:

Sponsoring Organization Name & Address:

Department of Trade
London W.C. 2
United Kingdom

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Noise studies covering instrumentation and analysis techniques for noise certification purposes, the social effects of aircraft noise, including reverse thrust, noise measurements including the production of NNI contour maps for such purposes as land use planning decisions and the evaluation of noise abatement techniques, night disturbance, etc.

Transcribed from the original.

Project Title:

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aircraft Establishment Farnborough Hampshire GU14 6TD United Kingdom	
Principal Investigator(s): J. Williams	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

RAE has continued to contribute to an international appraisal of the problems of noise measurement in ground-based facilities which provide forward-speed simulation. The RAE 5 ft tunnel has now been converted with a new resited fan and its aerodynamic performance checked; studies of its background noise reduction should start late in 1977, after completion of the anechoic working-chamber and of the circuit acoustic splitters. As regards application of the RAE 24 ft wind tunnel, further investigations relate to its working-chamber acoustics, in-flow microphone characteristics, and acoustic-mirror discrimination. Techniques for noise source location have been reviewed.

References

F. W. Armstrong
J. Williams — "Some UK Government Establishment research towards quieter aircraft." J.S. Vib. 47, (2) pp 207-236 (1976).

J. Williams — "Ground-based facilities with forward-speed representation for aircraft noise research." RAE Technical Memorandum Aero 1707 (1977). AGARD Lecture Series 80 Paper 11 (1976).

J. Williams (editor) — "Aerodynamic noise." AGARD Lecture Series 80 (1976).

Susan M. Damms — "The shielding method for noise source location and a review of alternative methods." RAE Technical Report TR 77032 (March 1977).

Transcribed from the original.

Project Title:

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aircraft Establishment Farnborough Hampshire GU14 6TD United Kingdom	
Principal Investigator(s): J. McKie	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): - Or Total Funding Amount: - COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

Two series of tests have been made in the RAE 24 ft acoustic wind tunnel on various nozzles to provide information both on the noise characteristics of the nozzles under static and forward speed conditions, and to provide data on which the tunnel as a facility can be assessed for comparison with other facilities in which the nozzles have been tested.

Reference

J. B. W. Edwards "Comparative measurments of the noise of cold air jets from three nozzles under static and forward speed conditions." RAE Technical Memorandum Aero 1692 ARC 37055 (Sept. 76).

Transcribed from the original.

BASIC RESEARCH AND TECHNOLOGY

ARCHITECTURAL STUDIES

See Also Pages:

57
69
117
126
128

Project Title:
Active Damping Methods for Plates and Framed Structures

Performing Organization Name & Address:
Civil Engineering Department
University of Leeds
Leeds, L52 9JT
United Kingdom

Sponsoring Organization Name & Address:
Civil Engineering Department
University of Leeds
Leeds, L52 9JT
United Kingdom

Principal Investigator(s):
L. A. Walker

Type of Research Program:
___ Fundamental
X Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Autumn 1977

Completion Date:
Estimated 1980
Actual _____

Funding:

Year	Amount
1976 (actual):	(£500) $860
1977 (budget):	not yet known
1978 (forecast):	" " "

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In the interests of improving airborne sound insulation of panels and of regulating room reverberation, the control of transverse vibration of a thin plate by application of active energy feedback has been evaluated in past work here. A localized point control force is derived from the sensed motion of some point on the plate surface. Control can be effective for particular points and for all resonant modal motions under conditions of light damping. The complete conditions for system stability are established. Bandwidth limitations are not found if the points of sensing and feedback are made identical.

Corresponding stability and performance conditions are known for an array of multiple damping units like the single one above.

Measured velocity dampings of 40 dB are found within the first three or four cycles of an impulsed plate. The method should be applicable to other structures (aircraft, ships, framed buildings) than the plate, above, and future work (the object of the reference) will concentrate on the application to framed structures.

References:

L. A. Walker and P. P. Yaneske, 'Characteristics of an active feedback system for the control of plate vibrations'. Jl. of Sound & Vibration (1976) Vol. 46(2) pp. 157-176.
L. A. Walker and P. P. Yaneske, 'The damping of plate vibrations by means of multiple active control systems'. Jl. of Sound & Vibration (1976) Vol. 46(2) pp. 177-193.

Project Title: Study of the Anticipated Measures in which Use is to be Made of Noise-Reducing Equipment in Noise Zones as well as the Optimal Presentation of Equipment Regulation

Performing Organization Name & Address:

Public Health & Environmental Hygiene Dept.
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
_X_ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Extra noise-resistent equipment is involved in the framework of the protection of homes. From the viewpoint of public health it is important that use be made of as large as possible a number of these insulation regulations (voluntarily).
Not only the quality of the equipment and the secondary effects play a role, but also the possible inconvenience of cultivation, but the presentation of the regulations by authorities is also of great importance.
The study includes a social science study for carrying out the preventive program. Also, the study serves to provide guidelines on a social-psychological basis for the presentation of regulations, as well as telling of unfavorable developments of the same type which occur around the English Heathrow airport.

Translated and transcribed from the original Dutch.

Project Title: Inventory Study into the Possibilities of Protecting Residences and Other Sound-Sensitive Buildings by means of Noise-Averting Equipment

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Air Service Amsterdam, Netherlands	Interdepartmental Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: ___ Fundamental _X_ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1976 est. / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

The purpose of the study is to come up with a general view of the possibilities for reducing the noise pollution within residences and buildings by means of extra noise insulation on the basis of the effectiveness of the so-called Building Technical Commission for Aircraft Noise as well as on the basis of data from abroad. This study can mean a further addition of a similar study into the study program of traffic noise. On the basis of a wide-spread literature study and data from the Dutch acoustical council, as a function of a stepwise classification into classes of different noise insulation, it can be indicated which insulation measures can be applied where attention should also be paid to secondary effects, as well as ventilation, thermal insulation, condensation effects as well as maintenance and cost aspects.
A distinction shall be made between devices on existing buildings and devices on new buildings to be built near the noise zone around aircraft terrain.

Translated and transcribed from the original Dutch.

Architectural Studies
Netherlands

Project Title: Test Study on the Use of Noise Resisting Equipment on Residences Counteracting Aircraft Noise

Performing Organization Name & Address:

Public Health & Environmental Hygiene Dept.
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
_X_ Development (Component or System)
_X_ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

This project envisions the use of noise resisting equipment already developed within the framework of activities of the Building Technical Commission on Aircraft Noise (carried out on a very small scale) on buildings subjected to aircraft noise on such a scale that significant data can be derived therefrom which is needed to determine the noise resisting equipment to be used around airport terrains within noise zones. Consideration is being given to the insulation of about 500 residences, distributed over a number of classes of different noise pollution in terms of Cost Units and peak stress in other comparable areas. In connection with this, a distinction is desirable in the equipment package according to residence type as well as according to total noise insulation. An experimental study is to be made in connection with this.

Translated and transcribed from the original Dutch.

Architectural Studies
Netherlands

Project Title: Study into the Possibilities of Saving on Energy Consumption for Heating Purposes and Fuel Costs in Residences Insulated Against Aircraft Noise

Performing Organization Name & Address:

Public Housing Establishment and Space Dept.
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
_X_ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In the study they are concerned with gaining insight into possible favorable side effects due to the application of noise-resisting equipment on residences.
This study includes a calculation of the savings to be anticipated as well as a testing in the practical situation. In the testing, attention needs to be paid to the influence of the reducing effective use of equipment during certain periods so that probably a distinction must be made between different forms of air travel.

Translated and transcribed from the original Dutch.

BASIC RESEARCH AND TECHNOLOGY

AIRCRAFT OTHER

Aircraft Other
Netherlands

Project Title:

Studies Concerning Zoning Legislation

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1977

Completion Date:
Estimated 1981
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year		Amount
1977 (actual):	(150,000 F)	$30,360
1978 (budget):	(150,000 F)	$30,360
1979 (forecast):	(150,000 F)	$30,360
1980 "	(150,000 F)	$30,360
1981 "	(150,000 F)	$30,360

Or Total Funding Amount:

COMMENTS:

The activities with the zoning around airport terrain, such as is regulated in the amendment to the aircraft law in preparation, shall be continued in 1977. Namely, these activities concern setting up a regulation. The calculations are set down for determining noise pollution around airports. A further development of the computation model for determining noise prevention is to be expected in 1977.

In later years, emphasis will be laid on collecting data needed for noise hindrance determination; to a considerable degree, these are dependent on the introduction and use of MLS-conducting systems and other future amendments to be made to the procedures.

Trnaslated and transcribed from the original Dutch.

Project Title:

Survey of Current Aviation Noise Research Projects

Performing Organization Name & Address:

Max-Planck Institute
Boettingerstr. 6-8
Boettingen
West Germany

Sponsoring Organization Name & Address:

Federal Minister for Research & Technology

Principal Investigator(s):

Prof. Dr. Ernst-August Mueller

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

March 1976

Completion Date:

Estimated Feb. 28, 1977
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(50,000 DM) $21,200.

COMMENTS:

All aviation noise-related research conducted in the FRG from January 1 to December 31 will be surveyed using a questionnaire, and documented in a catalogue. In addition, expert analysis of the collected information will lead to an evaluation of the general status of German research in this area.

Translated and transcribed from the original German.

Aircraft Other
West Germany

Project Title:
Study of the Terrain Noises Emanating from the Civilian Airport, Dusseldorf--Including the Parallel Track--and of the Possibility of Reducing These Noise Levels

Performing Organization Name & Address:

Technical Monitoring Association
Koeln, Konstantin-Wille-Str. 1
West Germany

Sponsoring Organization Name & Address:

Minister for Economy, the Middle Classes and Transportation
Dusseldorf

Principal Investigator(s):

Dr. S. C. Martinez

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Oct. 1, 1975

Completion Date:
Estimated _____
Actual Dec. 31, 1976

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Determination of present as well as anticipated noise levels under various weather conditions; including all noise sources, such as flight and traffic noises; ascertaining the percentage of noise for each individual source; proposal and evaluation of structural preventive measures.

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(73,000 DM) $30,952

COMMENTS:

Translated and transcribed from the original German.

Sweden. Development of Sonic Boom Carpets for Single and Twin Engined Propeller Aircraft. National Swedish Aeronautical Research Institute (FFA), Box 11021, S-161 11 Bromma, Sweden. Sponsor: National Board for Technical Development. Lennar Soernaes. March 1975-Feb. 1976. Total Funding Amount: (135,000 Skr) $30,416. Measurement and computation of sonic boom carpets for single and twin engined propeller aircraft.

West Germany. Study of the Effect of Noise Abatement Measures on the Operating Capacity of Frankfurt Airport. Federal Air Transportation Office, Braunschweig, Flughafen, West Germany. Ted Hooton. Total Funding Amount: (30,000 DM) $12,720. Study of the improvements effected in Frankfurt Airport. Alteration of the "fs" system in connection with the abandonment of the Wiesbaden-Erbeuheim Airport and its effect on the operating capacity of Frankfurt Airport. (Phase 2).

Aircraft Other
Netherlands

Project Title: Study of the Actual Noise Pollution Due to Airplanes at the Level of the Land

Performing Organization Name & Address:

Public Health and Environmental Hygiene
Royal Air Service, Defense
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

The study has the object of creating insight on an annual basis of the actual noise pollution for all relevant air traffic terrain in the Netherlands. The data are to be used for governmental purposes on various terrains: adaption of standards, phasing and adaption of noise preventive equipment in the framework of the prevention program within the noise zone, planological purposes, etc. A general view can be obtained by an aggregation of various noise pollution calculations for the different air flight terrains on the basis of actual data concerning the performance of flight, the number of aircraft movements, aircraft types and the like.

Translated and transcribed from the original Dutch.

Aircraft Other
Netherlands

Project Title:

Study of the Financial Evaluation of Noise Obstacles as a Result of Air Traffic

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Air Service Public Health & Environmental Hygiene Dept. Amsterdam, Netherlands	Interdepartmental Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1976 est. / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount: COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

On behalf of decisions concerning new air traffic terrain as well as modifications in use and the extension of available terrain, it is desirable to develop better evaluations on the basis of money for noise obstacles, than is presently the case. Different evaluation methods have been studied and applied in the framework of the analysis of a site for a second national airport, but the impression exists that insufficient attention has been paid to the noise aspect. A continuation of the named study is desirable.

Translated and transcribed from the original Dutch.

Aircraft Other
Netherlands

Project Title: Study into the Relationship Between Noise Pollution and Obstacles in the Vicinity of Military Aircraft Bases and Small Airports

Performing Organization Name & Address:

Public Health and Environmental Hygiene Dept.
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
_X_ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

On the basis of widespread tests, a relationship has been established by the Kost commission between noise pollution and the obstacles which are present. This relationship is specified by a traffic pattern which is typical for a civilian airport and with the use of a certain group of aircraft.
The purpose of this study is to go into how far the interpretation of the method of Kost is applicable for the judgment of noise pollution with another traffic pattern and another aircraft type, as well as with military flight bases and smaller airports.

Translated and transcribed from the original Dutch.

Aircraft Other
Netherlands

Project Title: Supplementary Investigation of the Sound Emission of Civil Aircraft Types over Accessible Dutch Aviation Terrain.

Performing Organization Name & Address:

Royal Aviation Service
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes.

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
__x__ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

This study concentrates on civil aviation (commercial aviation, general aviation and helicopters). The data are used to improve the prognosis of noise pollution, the calculation of actual noise pollution and for the adaption of rules for use to restrict noise.

Use should be made of foreign data wherever possible.

Translated and transcribed from the original Dutch.

Aircraft Other
Netherlands

Project Title: Study of the Possible Results and the Needed Data Concerning the Necessity of Zoning around Aviation Terrain, for which the Use of Aircraft with Turbine Jet Engines is Ruled Out (Smaller Airports)

Performing Organization Name & Address:

Royal Air Service
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
__x__ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
__x__ Measurement Methodology

Start Date:	Completion Date:
1976 est.	Estimated _____ Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In this study we are dealing with obtaining the needed data and insights with regard to the zoning of small, civilian aviation terrain. By means of this information, it can be determined how desired zoning can be achieved by planological and environmental hygiene considerations.

Translated and transcribed from the original Dutch.

Aircraft Other
Netherlands

Project Title: Study of the Possibilities of Zoning Aviation Terrain Which Does Not Lie on Dutch Territory, but Which Is Located on Territory Under Dutch Influence

Performing Organization Name & Address:

Public Health and Environment Dept.
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
__x__ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
__x__ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

The goal of the study is to come up with data in the form of noise-pollution curves concerning a certain military aviation territory lying in the boundary area between Germany and Belgium, where noise is experienced on the Dutch territory. Although an analogous zoning as for Dutch aircraft territory is not possible in the framework of the modified Flight Laws, the future noise abatement laws offer small possibilities for this. In the carrying out, use can be made of data to be provided by West German and Belgian authorities.

Translated and transcribed from the original Dutch.

Aircraft Other
Sweden

Project Title:
(Joint Committee for Establishment of a Noise Disturbance Zone Around Arlanda Airport)

Performing Organization Name & Address:
Regionplane- och näringslivsnämndens förvaltningskontor
Fack
103 40 STOCKHOLM 40 Sweden

Sponsoring Organization Name & Address:

Principal Investigator(s):
Board of Civil Aviation, Sweden

Type of Research Program:

___ Fundamental
_X_ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:
1974

Completion Date:
Estimated 1977
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

The joint committee can be regarded as a pilot project with the aim to develop a procedure for establishing noise disturbance zones around the Swedish airports. In the committee are represented regional and local planning authorities and the Board of Civil Aviation.

The committee has attempted to reach an agreement on the delineation of the noise disturbance zone that satisfies both the function of the airport and the development of the surrounding communities.

The basis for the discussion in the committee has been a series of alternative delineations of the zone derived from iterative manipulation of the underlying factors (runway alignment, routeing, runway utilization, types of aircraft, day/night-traffic etc).

Aircraft Other
United Kingdom

Project Title:

Assessment of the Effects of Multimodal Response on Fatigue Life

Performing Organization Name & Address:

British Aircraft Corporation Ltd.
Commercial Aircraft Division
Brooklands Road
Weybridge, Surrey, KT13 OSF
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

D. C. G. Eaton
G. A. Failey

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

The suitability of using fatigue data as derived from single degree of freedom response tests for the prediction of fatigue life of corresponding multimodal response configurations has been questioned. A series of controlled tests on free beams is proposed in which modal characteristics and strain distributions will be determined for certain selected inputs. A comparison will be made of fatigue life against stream levels for the fundamental mode and two mode studies, wherein the random excitation will be centered upon the fundamental frequency and fundamental plus an harmonic frequency, respectively.

Transcribed from the origianl.

Aircraft Other
United Kingdom

Project Title:

Aircraft Engine Noise

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
ROLLS-ROYCE LTD., DERBY, ENGLAND	H. M. GOVERNMENT MOD (PE)

Principal Investigator(s):

Dr. G. E. PEARSON

Type of Research Program:

___ Fundamental
___ Development (Component or System)
_X_ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
	Estimated _____
	Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Investigations of sound absorber wall linings in a flow duct facility, (situated at NGTE Pyestock, Hants, England). These experimental investigations cover single layer and double layer liners, bulk absorbers and some proprietary panels basically in a rectangular duct. Effect of discontinuities in the lining type, and area changes in the duct are being investigated. More recent projects cover circular and annular lined ducts, and splitters.

Aircraft Other
United Kingdom

Project Title: *Initial Studies of the Response and Acoustic Fatigue Behaviours of Titanium Development Structure*

Performing Organization Name & Address:
British Aircraft Corporation Ltd.
Commercial Aircraft Division
Brooklands Road
Weybridge, Surrey KT13 OSF
United Kingdom

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In future aircraft and space vehicles, certain areas of the structure will be subjected to high noise loadings. Application of structures constructed of titanium have been suggested for use in such areas. It is proposed that first assessments of the fatigue resistance of titanium structures be carried out on specimens manufactured for a current R and D programme. It is envisaged that typical response and fatigue behaviour be observed from siren and coupon tests and the results correlated with a theoretical study.

Transcribed from the original.

Aircraft Other
West Germany

Project Title: Investigation of Noise Protection Zones According to the Aviation Noise Protection Act of March 3, 1971.

Performing Organization Name & Address:

Max-Planck Institute for Jet Research
Boettingerstr. 6-8
Goettingen
West Germany

Sponsoring Organization Name & Address:

Principal Investigator(s):

Dr. Klaus Matschat

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
_x_ Measurement Methodology

Start Date: Aug. 1, 1971

Completion Date:
Estimated Dec. 31, 1976
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Plan: Determination of the noise protection areas according to the Aviation Noise Protection Act of 3-30-71. Development of the method according to which the noise protection zone defined in par. 2 of the aircraft noise law is to be determined. (a) development of a questionnaire for prognosis of the foreseeable flight operations at an airport ("data determination system of the"); (b) development of the method according to which the curves of the constant equivalent noise levels are determined in the vicinity of the airport ("instructions for calculation azb"); (c) carrying out the noise protection zone determinations for the airports of the Federal Republic of Germany.

Translated and transcribed from the original German.

Norway. Primary Noise Generating Mechanisms. Sintef, The Laboratory of Acoustics, ELAB, Univesitetet I Trondheim, 7034 Trondheim, Norway. January 1, 1975. Detailed studies of aeroacoustic noise generating mechanisms. Classification and identification of primary noise generating mechanisms.

United Kingdom. Two-Stream Mixing Noise: Similarity Considerations. Southampton University, Institute of Sound and Vibration Research, Southampton SO9 5NH, United Kingdom. C. L. Morfey.

United Kingdom. Aerodynamic Noise Theory: Boundary Effects in Non-Uniform Flows. Southampton University, Institute of Sound and Vibration Research, Southampton SO9 5NH, United Kingdom. C. J. Morfey. Publication - "Aerodynamic sound from non-uniform flows with boundaries." C. L. Morfey 1976 Proceedings. 14th Int. Congress on Theoretical and Applied Mechanics, Delft. Paper 249.

United Kingdom. Investigation of the Trade-Off Effect of Aircraft Noise and Number. University of Southampton, Institute of Sound and Vibration Research, Southampton SO9 5NH, United Kingdom.

United Kingdom. Development of Momentum Potential Theory for Fluctuating Fluid Flows. Southampton University, Institute of Sound and Vibration Research, Southampton SO9 5NH, United Kingdom. P. E. Doak.

United Kingdom. Work on Compliance with Annex 16 ICAO Standards (Noise Certification Levels). Dept. of Trade, London, United Kingdom. 1977.

United Kingdom. Laser Velocimeter Measurements in Subsonic and Supersonic Jets (Co-operative Work with Lockheed-Georgia Company). Southampton University, Institute of Sound & Vibration Research, Southampton SO9 5NH, United Kingdom. J. C. Lau, P. J. Morris, M. J. Jisher. Publication "Noise measurements in a free-jet flight simulation facility: shear layer refraction and facility-to-flight corrections." C. L. Morfey and B. J. Tester 1976 AIAA Paper No. 76-531.

SYSTEMS DEMONSTRATION, PROPULSION

DEMONSTRATION, AND SYSTEMS STUDIES

CTOL (Subsonic)

See Also Pages:

36
52
90
122

Project Title: Collection of Data Concerning Noise Hindrance Calculations and the Control in the Performance of Flight Procedures

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976

Completion Date: Estimated 1980 / Actual ____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year		Amount
1976 (actual):	(125,000 F)	$25,300
1977 (budget):	(80,000 F)	$16,192
1978 (forecast):	(50,000 F)	$10,120
1979	(50,000 F)	$10,120
1980	(50,000 F)	$10,120

Or Total Funding Amount:

COMMENTS:

Explanation: As in the preceding year, in 1976 the NLR shall make use of a L4/5 radar made available by the Royal Air Force in order to ascertain aircraft starting and landing at Schiphol.

As expected, the measurement of runways in or after 1976 was carried out with something else than the now conventional L4/5 radar, seeing this is no longer available.

Translated and transcribed from the original Dutch.

Project Title: Setting Up Long Term Prognoses Concerning Noise Production of CTOL Aircraft and Study of Low Noise Flight Procedures

Performing Organization Name & Address:

National Lucht- en Ruimtevaartlaboratorium
Anthony Fokkerweg 2
Amsterdam 1017
Netherlands

Sponsoring Organization Name & Address:

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976

Completion Date:
Estimated 1980
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year		Amount	
1976	(actual):	(60,000 F)	$12,144
1977	(budget):	(70,000 F)	$14,168
1978	(forecast):	(80,000 F)	$16,192
1979	"	(90,000 F)	$18,216
1980	"	(100,000 F)	$20,240
1981	"	(110,000 F)	$22,264

COMMENTS:

The activities begun in 1975 in the framework of this study are to be continued in 1976. These activities can be described as follows:

- study of the influence of aircraft design parameters on the noise production of airplanes,
- indication of the most probable development of new aircraft types,
- following of technical developments which are directed at the modification of existing aircraft types (retrofit),
- the study of noise requirements; present day as well as recent concepts.

The named activities are to be carried out with the accompaniment of a Steering Group in which different Netherlands concerned organizations take part.

It is probable that this study will extend over a number of years, also in connection with the adaptation of results on the basis of new data and insights.

In connection with the study carried out in 1975 concerning the reduction of the noise level of aircraft heard on the ground by "low-power low drag" procedures, the noise aspects of other flight procedures were studied, such as "reduced flap setting" during approach.

Translated and transcribed from the original Dutch.

Project Title:

A Further Study of the Effects of Approach Procedures on Noise (Lockheed L-1011 and BAC 1-11 Aircraft)

Performing Organization Name & Address:

British Airways European Division
London (Heathrow) Airport
Hounslow, Middlesex TW6 2JR

Sponsoring Organization Name & Address:

Procurement Executive, Ministry of Defence
John Adam Street, London WC2N 6BB

Principal Investigator(s):

R H Chowns
Principal Noise Engineer

Type of Research Program:

X Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
X Measurement Methodology

Start Date:

Completion Date:
Estimated ____
Actual June 1976

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount: (£11500) $19,775

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In this second study of the effect of approach procedures on community noise, the original examination of the Trident 3 has been extended to include the L-1011 and the BAC 1-11 aircraft.

Recommendations are made for further work in regard to performance margins and to the method of assessment used and for a study of the implications, in terms of flight control system response and aircraft handling, of steeper than 3° approach paths.

JF/8/060
Technical Note Nr P/690

June 1976

CTOL (Subsonic)
Netherlands

Project Title: Study of the Adoption Possibilities of Flight Procedures Favorable from a Noise Prevention Viewpoint for Certain Aviation Terrain

Performing Organization Name & Address:

Royal Aviation Service
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
__x__ Development (Component or System)
__x__ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In the study, we are dealing with obtaining more insight into the possibilities of 2-segment approach, noise-abatement start procedures, noise-routing and the like. Attention must be paid to the practical possibilities from the standpoint of flight safety, air traffic control, operational-economic results and the working out of local noise pollution problems. The study also serves to gain insight into the instrumentation problems belonging thereto, including costs.

Translated and transcribed from the original Dutch.

CTOL (Subsonic)
Netherlands

Project Title: Study into the Possibilities and Results of Combatting Certain Types of Noise from the Dutch Air Fleet

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Royal Aircraft Service Amsterdam, Netherlands	Interdepartmental Commission for Reducing Noise over Air Traffic Routes
Principal Investigator(s):	Type of Research Program: ___ Fundamental __x_ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1976 est. Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): Or Total Funding Amount:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	COMMENTS:

This study aims at coming up with operationally useable data concerning the possible application of noise abatement modifications on the DC-8 and DC-9 aircraft in connection with measures to be taken abroad.

In particular, insight is to be gained into the technical aspects, the influence of exploitation, cost and financing possibilities of the re-fitting, time it takes to carry this out and the results of the noise pollution of Schiphol.

Transcribed and translated from the original Dutch.

CTOL (Subsonic)
United Kingdom

Project Title:
Operational Noise Abatement

Performing Organization Name & Address:	Sponsoring Organization Name & Address:
Dept. of Trade London, United Kingdom	
Principal Investigator(s):	Type of Research Program: ___ Fundamental ___ Development (Component or System) ___ Demonstration (Experimental, Prototype, or Production) ___ Measurement Methodology
Start Date: 1977 / Completion Date: Estimated _____ Actual _____	Funding: Year / Amount 1976 (actual): 1977 (budget): 1978 (forecast): - Or Total Funding Amount: - COMMENTS:
Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)	

Noise abatement procedures (such as managed drag, two-segment approach, etc.) Night operations: night jet restrictions, runway alternations, night disturbance levels, etc.

Transcribed from the original.

CTOL (Subsonic)
West Germany

Project Title: Flight Noise Abatement by Flight-Mechanical Means and By Airplane Design

Performing Organization Name & Address:
Institute for Flight Technology
Darmstadt, Petersenstr. 18
West Germany

Sponsoring Organization Name & Address:
German Research Society

Principal Investigator(s):

Invest. Dipl. -Ing. Volker Nitsche

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

The aim is to demonstrate in a comprehensive manner the possibility of noise abatement by steeper takeoff and landing flight paths. For this purpose, the noise level is examined for the various technically feasible flight paths within the spectrum of future airplane propulsion categories. Individual flight patterns are thoroughly tested for feasibility in a flight simulator with visual simulation to ascertain the limits of possibility, taking into account the stresses exerted on the pilot.

Translated and transcribed from the original German.

SYSTEMS DEMONSTRATION, PROPULSION

DEMONSTRATION, AND SYSTEMS STUDIES

CTOL (Supersonic)

See Also Page:

118

Project Title:

Lift-Related Sonic Boom of Airplanes

Performing Organization Name & Address:
Institute for Fluid Dynamics of the DFVLR
Goettingen, Bunsenstr. 10
West Germany

Sponsoring Organization Name & Address:

Federal Minister for Research and Technology
Federal Defense Minister

Principal Investigator(s):

SUN

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:
Jan. 1, 1972

Completion Date:
Estimated ~~Dec. 31,~~ 1977
Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Theoretical study of the pressure distribution (boom distribution) caused by a supersonic plane and investigation of the possibility for a boom-adjusted design for supersonic airplanes.

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount: (300,000 DM) $127,200

COMMENTS:

Translated and transcribed from the original German.

SYSTEMS DEMONSTRATION, PROPULSION

DEMONSTRATION, AND SYSTEMS STUDIES

ROTORCRAFT/VTOL

See Also Pages:

47
48
49
50
122
153

Project Title: Flight Mechanical Studies Concerning the Problem of Steep Flight Paths for VTOL Airplanes with Best Noise Characteristics

Performing Organization Name & Address:

Institute for Flight Technology of Darmstadt Technical Institute
Darmstadt, Petersenstr. 18
West Germany

Sponsoring Organization Name & Address:

German Research Society

Principal Investigator(s):

Dipl. -Ing Volker Nitsche

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:	Completion Date:
May 1, 1970	Estimated _____ Actual _____

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	
Or Total Funding Amount:	(325,000 DM) $137,800

COMMENTS:

In this project, optimum takeoff and landing flight paths are computed for typical VTOL planes by varying the maximum takeoff thrust. The required flight time and fuel consumption are determined. The effect of the various takeoff and launching flight paths and of the thrust as well as of atmospheric conditions on the shape and size of the noise screening area around a VTOL Landing field with a given yearly traffic volume. The boundary of the area is determined within which the flight noise exceeds the limits set by the German laws for the protection against flight noise. In contrast, calculation is made for an expanded definition of the noise protection area by using larger values for the noise coefficient.

Translated and transcribed from the original German.

Project Title:
Helicopter Noise Studies

Performing Organization Name & Address:

Sponsoring Organization Name & Address:
Department of Trade
London W.C. 2
United Kingdom

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date:

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Project Title:

Flight Path of VTOL Airplanes for Optimum Noise Pattern

Performing Organization Name & Address:

Institute for Aviation
Mechanics of the DFVLR
Braunschweig,
Flughafen, West Germany

Sponsoring Organization Name & Address:

Federal Minister for Research and Technology
Federal Defense Minister

Principal Investigator(s):

Dr. -Ing. Wilhelm

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: Sept. 1, 1971

Completion Date:
Estimated _____
Actual Dec. 31, 1977

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

Noise abatement for short and vertical takeoff planes. Research on steep landing approach in the interest of noise abatement for traditional airplanes; effect of parameters; new piloting techniques, such as upthrust piloting. Flight tests with variable-configuration plane hfb-320 s-1; simulated flights; problems of flight characteristics.

Translated and transcribed from the original German.

SYSTEMS DEMONSTRATION, PROPULSION

DEMONSTRATION, AND SYSTEMS STUDIES

GENERAL AVIATION

See Also Pages:

49
52
92
97
118
122
123

Project Title: Supplementary Study into Requirements, Viewpoints on Noise Prevention and Noise Production, the Equipping and Use of Civil Aircraft at Present Not Falling under International Noise Certification

Performing Organization Name & Address:

Royal Aircraft Service
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
_x_ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

In this special general aviation study, which also concerns helicopters, we are dealing with an inventory of the state of aviation technology to be expected in the near future and today in the area of noise combatting, the regulations to be set up in the near future, the possibilities of achieving a lower noise production by means of noise-damping equipment and the consequences of this for Dutch general aviation.

It also deserves to be studied in this connection how noise pollution from this form of flight can be reduced by setting special rules of use, especially with regard to advertising flights and sport flights.

Transcribed and translated from the original Dutch.

General Aviation
Netherlands

Project Title: Study of the Adoption Possibilities of Noise Limiting Regulations for Civilian Aircraft and the Influence of Noise Pollution

Performing Organization Name & Address:

Royal Aviation Service
Amsterdam, Netherlands

Sponsoring Organization Name & Address:

Interdepartmental Commission for Reducing Noise over Air Traffic Routes

Principal Investigator(s):

Type of Research Program:

___ Fundamental
___ Development (Component or System)
___ Demonstration (Experimental, Prototype, or Production)
___ Measurement Methodology

Start Date: 1976 est.

Completion Date:
Estimated _____
Actual _____

Funding:

Year	Amount
1976 (actual):	
1977 (budget):	
1978 (forecast):	

Or Total Funding Amount:

COMMENTS:

Project Summary: (Briefly describe the goals, approach, expected or actual results, report(s) generated and the date(s) of publication.)

This investigation includes a closer study of the adaption of regulations including time restrictions for certain noisy types of aircraft, rules for flight instruction and practical flights, sport aviation and the like. Attention must be paid to the practical possibilities from the viewpoint of flight safety, air traffic control, the operational-economic consequences and working out local noise pollution problems.

Translated and transcribed from the original Dutch.

COUNTRY INDEX OF RESEARCH PROJECTS

CANADA — Page

Propulsion Noise

Noise Reduction in Axial Blowers. 23

Study of Axial Flow Fan Aeroacoustics. 29

DENMARK

Measurement Methodology

Movable Monitoring System, Verification of Calculation Method. 87

Guidelines on the Calculation and Evaluation of Air Traffic Noise. 88

NETHERLANDS

Propulsion Noise

Study of the Possibilities of Aviation-Technical Innovations to Reduce the Noise Emission of Aircraft. 30

Study into the Possibilities and Consequences of Noise-Damping and Protective Devices for Ground Run-up. 42

Noise Prediction Technology

Studies Involving the Zoning Legislation and Developing a Computer Model. 73

Measurement Methodology

Working Up and Analysis of Noise Measuring Recordings. 89

Measurements on Runways. 90

Preventing Noise Caused By Aircraft. 91

Development of a Standard Measuring Procedure for Aircraft Noise. 96

Study of the Design of a Noise Guard System. 97

Development of a Standard Calculation Method for Noise Pollution Caused by Airplanes. 98

NETHERLANDS (Continued)

Architectural Studies

Study of the Anticipated Measures in which Use is to be Made of Noise-Reducing Equipment in Noise Zones as well as the Optimal Presentation of Equipment Regulation. 108

Inventory Study into the Possibilities of Protecting Residences and Other Sound-Sensitive Buildings by means of Noise-Averting Equipment. 109

Test Study on the Use of Noise Resisting Equipment on Residences Counteracting Aircraft Noise. 110

Study into the Possibilities of Saving on Energy Consumption for Heating Purposes and Fuel Costs in Residences Insulated Against Aircraft Noise. 111

Aircraft Other

Studies Concerning Zoning Legislation. 115

Study of the Actual Noise Pollution Due to Airplanes at the Level of the Land. 119

Study of the Financial Evaluation of Noise Obstacles as a Result of Air Traffic. 120

Study into the Relationship Between Noise Pollution and Obstacles in the Vicinity of Military Aircraft Bases and Small Airports. 121

Supplementary Investigation of the Sound Emission of Civil Aircraft Types over Accessible Dutch Aviation Terrain. 122

Study of the Possibile Results and the Needed Data Concerning the Necessity of Zoning around Aviation Terrain, for which the Use of Aircraft with Turbine Jet Engines is Ruled Out (Smaller Airports). 123

Study of the Possibilities of Zoning Aviation Terrain Which Does Not Lie on Dutch Territory, but Which Is Located on Territory Under Dutch Influence. 124

NETHERLANDS (Continued)

CTOL (Subsonic)

Collection of Data Concerning Noise Hindrance Calculations and the Control in the Performance of Flight Procedures. 133

Setting Up Long Term Prognoses Concerning Noise Production of CTOL Aircraft and Study of Low Noise Flight Procedures. 134

Study of the Adoption Possibilities of Flight Procedures Favorable from a Noise Prevention Viewpoint for Certain Aviation Terrain. 136

Study into the Possibilities and Results of Combating Certain Types of Noise from the Dutch Air Fleet. 137

General Aviation

Supplementary Study into Requirements, Viewpoints on Noise Prevention and Noise Production, the Equipping and Use of Civil Aircraft at Present Not Falling under International Noise Certification. 153

Study of the Adoption Possibilities of Noise Limiting Regulations for Civilian Aircraft and the Influence of Noise Pollution. 154

NORTHERN IRELAND

Noise Spectra for the Environs of Belfast Airport. 92

NORWAY

Aircraft Other

Primary Noise Generating Mechanisms. 130

SWEDEN

Aircraft Other

Development of Sonic Boom Carpets for Single and Twin Engined Propeller Aircraft. 118

(Joint Committee for Establishment of a Noise Disturbance Zone Around Arlanda Airport) 125

UNITED KINGDOM

Propulsion Noise

Jet Noise Control. 24

Noise Radiated by Ducted Fans. 25

Noise Radiation by Rotating Blading. 26

Preliminary Study of the Forward Speed Effects of Turbomachinery Tones. 31

Aircraft Engine Noise. 32

Aircraft Engine Noise. 33

Jet Noise Source Location. 34

Untitled project on jet noise mechanisms 35

Aircraft Engine Noise. 36

Aircraft Powerplant Noise Research. 37

Aircraft Engine Noise. 39

Aircraft Engine Noise. 40

Aircraft Engine Noise. 42

Aircraft Engine Noise. 42

Turbulence Measurements in Connection with Jet Noise Source Location Work. 42

Forward Flight Effects on Jet Noise (Co-operative Work with Lockheed-Georgia Company) 42

Retrofit-Aircraft. 42

Research on Quieting Engines and Air Frames. 42

The Role of Flow-Acoustic Interaction Effects in Jet Noise. 43

Rotor Noise

Theoretical Studies and High Speed Flight Tests. 47

UNITED KINGDOM (Continued)

Helicopter Noise Control. 48

Untitled project on helicopter noise. 50

Interior Noise

Vibration Transmission Paths Study. 55

Noise and Vibration Survey During Flight. 56

Helicopter Cabin Noise Laboratory Evaluation of Vibrating Panel Treatments. 57

Internal Noise Study on Rotor Rig. 58

Internal Noise Study-Noise Vibration Monitoring on Gearbox Rigs. 59

Airframe Noise

Untitled project on airframe noise shielding. 63

Untitled project on airframe noise shielding. 65

Untitled project on airframe noise. 66

Untitled project on airframe noise shielding. 67

Vortex Refraction. 68

Structural Response Under Turbulent Flow Excitations. 69

Untitled project on jet-surface interactions. 70

Jet/Surface Interaction Noise. 70

Turbulent Dissipation as a Source of Sound. 70

Noise Prediction Technology

The Effect of Forward Speed on Jet Noise. 74

Aircraft Engine Noise. 75

Untitled project on scale model simulator. 76

Aircraft Engine Noise. 77

UNITED KINGDOM (Continued)

Aircraft Engine Noise. 78

Coherent Structure in Jet Turbulence. 79

Jet Noise Prediction from Inviscid Flow Models. 80

Atmospheric Propagation and Ground Effects

Propagation of Sound in the Atmosphere. 83

Measurement Methodology

Aircraft Noise Measurement Programme. 93

Development of Closed Working Section Anechoic Wind Tunnel. 94

Effects of Microphone Height on Aircraft Noise Measurements. 99

National Calibration Standards for Sound Pressure and Noise Measurement. 100

Untitled project on noise certification. 101

Untitled project on anechoic wind tunnel tests. 102

Untitled project on anechoic wind tunnel tests. 103

Architectural Studies

Active Damping Methods for Plates and Framed Structures. 107

Aircraft Other

Assessment of the Effects of Multimodal Response on Fatigue Life. 126

Aircraft Engine Noise. 127

Initial Studies of the Response and Acoustic Fatigue Behaviours of Titanium Development Structure. 128

Two-Stream Mixing Noise: Similarity Considerations. 130

Aerodynamic Noise Theory: Boundary Effects in Non-Uniform Flows. 130

Investigation of the Trade-Off Effect of Aircraft Noise and Number. 130

UNITED KINGDOM (Continued)

Development of Momentum Potential Theory for Fluctuating Fluid Flows. 130

Work on Compliance with Annex 16 ICAO Standards (Noise Certification Levels. 130

Laser Velocimeter Measurements in Subsonic and Supersonic Jets (Co-operative Work with Lockheed-Georgia Company). 130

CTOL (Subsonic)

A Further Study of the Effects of Approach Procedures on Noise (Lockheed L-1011 and BAC 1-11 Aircraft). 135

Operational Noise Abatement. 138

Helicopter Noise Studies. 148

WEST GERMANY

Propulsion Noise

Study of the Distribution of Sound Sources in Turbulent Gas Jets. 27

Noise Formation and Noise Reduction for Turbine Stages with Cool Air Directed onto the Turbine Guide Blades. 28

Reduction of Propulsion Noise 41

Study and Reduction of Noise Generation by Engine Components 43

Research on Noise Generation by Encased Propellers as a Function of their Design Parameters. 43

Rotor Noise

Noise Reduction in Propulsion of Propeller Driven Airplanes. 49

Relation Between the Noise Generated by Rotors and the Defined Disturbance in the Air Flow. 51

Noise Reduction for Propeller Driven Aircraft. 52

Airframe Noise

Interference in Ultrasonic Radiation. 64

WEST GERMANY (Continued)

Measurement Methodology

Production of Noise Protection Maps. 95

Aircraft Other

Survey of Current Aviation Noise Research Projects. 116

Study of the Terrain Noises Emanating from the Civilian Airport, Dusseldorf--Including the Parallel Track--and of the Possibility of Reducing These Noise Levels. 117

Study of the Effect of Noise Abatement Measures on the Operating Capacity of Frankfurt Airport. 118

Investigation of Noise Protection Zones According to the Aviation Noise Protection Act of March 3, 1971. 129

CTOL (Subsonic)

Flight Noise Abatement by Flight-Mechanical Means and By Airplane Design. 139

CTOL (Supersonic)

Lift-Related Sonic Boom of Airplanes. 143

Rotorcraft/VTOL

Flight Mechanical Studies Concerning the Problem of Steep Flight Paths for VTOL Airplanes with Best Noise Characteristics. 147

Flight Path of VTOL Airplanes for Optimum Noise Pattern. 149

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978-720-335/6031-31