UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

July 19, 1974

I am transmitting the initial draft of a project report dated July 16, 1974, entitled, "Regulation of Airport Noise".

This draft has not been formally released by the Environmental Protection Agency (EPA) and should not be construed to represent Agency policy. Nor should it be construed to represent the official view of the Office of Noise Abatement and Control. It is being circulated to interested representatives of government, industry, environmental organizations and the general public for review and comment.

This project report (as it evolves through sequential drafts to its final form) should be looked upon as the evolving data base to support a regulation which the EPA will formally submit to the FAA as provided for in Section 611 of the Federal Aviation Act as amended by the Noise Control Act of 1972. The target date for this submittal to the FAA is the spring of 1975.

Your comments on the general thrust and scope of the development effort as revealed by this draft are particularly solicited, together with any views, data, or recommendations which you believe may assist in the further development of an airport noise regulatory program. Your comments, in writing prior to October 1, will be greatly appreciated.

Sincerely yours,

Alvin F. Meyer, Jr.
Deputy Assistant Administrator
for Noise Control Programs

DRAFT

PROJECT REPORT

REGULATION OF AIRPORT NOISE

July 16, 1974

NOTICE

This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

SUMMARY

The aviation industry is of immense importance to the United States; contributing hundreds of thousands of dollars to the national economy by providing a fast, efficient system of transportation. But aviation produces noise which is severely detrimental to the health and welfare of millions of individuals. The result has been an ever-increasing conflict between the beneficiaries of aviation and those who suffer from the noise which it produces.

To resolve this conflict, Congress has given the Federal Aviation Administration (FAA) the authority to control aircraft and airport noise, and has ordered the Environmental Protection Agency (EPA) to advise the FAA on how best to exercise that authority to protect the public health and welfare. There are three, and only three, possible types of approaches to the reduction of airport noise impact: reduction of noise at the source through changes to aircraft, reduction of noise at the receivers through changes in aircraft flight paths and procedures and reduction of the sensitivity of receivers through changes in land use. None of these approaches can completely solve the problem, but some combination of them -- the particular combination depending upon the characteristics of particular airport environments -- can bring about a resolution of the conflict between noise and the benefits of aviation at each airport.

Other reports by the Office of Noise Abatement and Control will consider in detail the possible modifications to aircraft and flight procedures to reduce noise. This particular draft report discusses the possible approaches to land use control to reduce airport noise impact; a procedure by which a noise abatement plan representing an optimal set of noise abatement options can be established for each noise-impacted airport; and the existing legal authority with which the Federal Government could enforce such plans. Based upon the final report, a regulation will be proposed to the FAA to bring about the creation of plans both to ameliorate noise impact at airports where this nuisance is now present and also to help prevent the growth of this problem at airports which do not presently have an encroachment problem.

PROLOGUE

The Noise Control Act of 1972 (Public Law 92-574) amended the Federal Aviation Act of 1958 to include to concept of "public health and welfare" among the decisional criteria for regulatory actions and to define the responsibilities of an interrelationships between the Federal Aviation Administration and the Environmental Protection Agency in the control and abatement of aircraft noise and sonic boom. Specifically, the Noise Control Act requires that, in order to afford present and future relief and protection to the public health and welfare from aircraft noise and sonic boom, the FAA, after consultation with the EPA, prescribe and amend such regulations as the FAA may find necessary to provide for the control and abatement of aircraft noise and sonic boom.

The Noise Control Act also requires that EPA submit to the FAA proposed regulations to provide such control and abatement of aircraft noise and sonic boom (including control and abatement through the exercise of any of the FAA's regulatory authority over air commerce or transportation or over aircraft or airport operations) as EPA determines is necessary to protect the public health and welfare. EPA's regulatory proposals to the FAA are to be submitted not earlier than completion and submittal of the comprehensive Report to Congress on Aircraft and Airport Noise, also required by Section 7 of the Noise Control Act.

That aircraft/airport noise study, which was completed and submitted to Congress in July 1973, was required to investigate the

1. adequacy of Federal Aviation Administration flight and operational control;

2. adequacy of noise emission standards on new and existing aircraft, together with recommendations on the retrofitting and phase-out of existing aircraft;

3. implications of identifying and achieving levels of cumulative noise exposure around airports; and

4. additional measures available to airport operators and local governments to control aircraft noise.

This study was implemented by a public task force composed of six task groups whose product consisted of six task group reports. The report to Congress was developed by EPA staff, following the completion of the task force effort. 1-7/

Concurrent with the aircraft/airport noise study, the EPA prepared a general document of criteria related to noise and its effects, 8/ as mandated by Section 5(a)(1) of the Noise Control Act. This "criteria document" reflects the scientific knowledge most useful in indicating

the kind and extent of all identifiable effects on the public health and welfare which may be expected from different quantitities and qualities of noise.

In addition, as mandated by Section 5(a)(2) of the Noise Control Act, the EPA prepared and published in March 1974 a document on the levels of environmental noise, the attainment and maintenance of which in defined areas under various conditions are requisite to protect the public health and welfare with an adequate margin of safety. 9/ It should be emphasized that the levels identified therein represent only one of several (conflicting) statutory decisional criteria which must be considered by the Federal government in promulgating regulations concerning noise.

As a result of the aircraft/airport noise study of 1973, EPA determined that an effective program to protect the public health and welfare with respect to aircraft noise would require the development by EPA and FAA and promulgation by FAA of three complementary types of regulations, which taken together form a comprehensive aircraft noise control program:

1. noise abatement flight procedures;

2. noise source emission regulations affecting the design of new aircraft and requiring the modification or phase-out of certain portions of the existing fleet; and

3. an airport noise regulation.

The airport noise regulation is the topic of the present project report and associated development program.

To complete the reader's perspective against which to review this project report, it should be noted that EPA intends to submit to the FAA proposals concerning the first two categories (flight procedures and emission regulations) prior to submittal of the airport noise regulation proposal. The specific regulatory topics (under development at EPA and FAA) in these two categories are:

1. Flight procedures

   a. Takeoff procedures

   b. Approach and landing procedures

   c. Minimum altitudes

2. Noise Emission Regulations

   a. Retrofit/fleet noise level

b. Supersonic civil aircraft

c. Modifications to FAR 36

d. Propeller-driven small airplanes

e. Short haul aircraft (including vertical, short or reduced takeoff or landing aircraft)

Information concerning the status of, and schedule for, the above regulatory topics at FAA and EPA can be obtained by contacting the FAA Office of Environmental Quality and the EPA Office of Noise Control Programs respectively.

At both EPA and FAA, the development of a noise regulation begins with the preparation of a project report, which is primarily a technical document incorporating as much definitive information as possible on those aspects of regulatory alternatives which are necessary to decision-making. The project report, in its final form, provides the basic input necessary for the preparation of a Notice of Proposed Rule Making (NPRM), which will be the format of each regulation to be submitted by the EPA to the FAA. Whenever the FAA precedes the EPA in proposing a regulation for any of the above topics (as is the case in several of the aircraft noise regulation topics listed above), the EPA project report becomes the supporting document for the official EPA position in the consultation process.

There are a series of opportunities for public input into the aircraft and airport noise rule making process. On February 19, 1974, the EPA issued a Notice of Public Comment Period listing the above regulatory topics and inviting interested persons to participate in EPA's development of regulatory proposals, by submitting such written data, views or arguments as they might desire. 10/ For the airport noise regulation, the official comment period in that Notice closed June 26, 1974. However, public comments are always received and considered by EPA, regardless of official closing dates, up to such time as they can no longer be effectively considered prior to the submittal of the regulatory proposal to FAA.

Project reports provide a more definitive basis upon which public review and comment can be based. They are circulated to anyone who requests to be placed on the mailing list for project reports on a specific regulatory topic.

Following the proposal of a regulation by the EPA to the FAA, there will be additional opportunities for public participation in the rule making process. Within thirty days of EPA's submission of a proposal to the FAA, the FAA is required to publish the proposed regulation, in a Notice of Proposed Rule Making, in the Federal Register. Within sixty days after such publication, the FAA is required to commence a hearing at which interested persons are afforded an opportunity for oral and written presentations of data, views and arguments. "Within a reasonable time after the conclusion

of such hearing and after consultation with EPA," the FAA is required in Section 7 of the Noise Control Act to (1) prescribe regulations substantially as submitted by EPA or which are a modification of those proposed by EPA, or (2) publish in the Federal Register a notice that it is not prescribing any regulation in response to EPA's submission of proposed regulations, together with a detailed explanation providing the reasons for this decision. There then ensues a dialogue between the FAA and EPA, as set forth in Section 7(c) of the Noise Control Act, plus the publication by FAA of an environmental impact statement. The final decision on whether to promulgate a regulation in a specific subject area, and the precise nature of the regulation to be promulgated, rests with the FAA, or with levels of the Executive Branch above the FAA Administrator.

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A. The Aviation Industry

The aviation industry has an appropriate analogy in the time-worn "iceberg" concept. The tip of the iceberg is the airport where the general public is most often exposed to its normal conception of aviation, i.e., commercial air carrier operations. The submerged part of the iceberg, of which the public is often unaware, consists of a multitude of manufacturing enterprises and service organizations which are an integral part of commercial, general and military aviation. The aviation industry is a major employer. In 1970, employment in commercial aviation was 349,000 persons and that employment induced for its suppliers was estimated at nearly 103,000 persons; in addition, about 645,000 individuals were employed in the manufacture of civilian aircraft, engines, and parts. Another 500,000 persons may have been employed by other industries as a result of indirect investment generation. 1/

The facet of the total aviation industry which is of greatest concern to this project is transportation and other public services, e.g., scheduled carriers, commuter (scheduled) airlines, charters, corporate/executive aviation, personal business aviation, personal non-business aviation and special uses. A brief description of the several classes of aviation activity is presented below.

(1) Scheduled Carriers -- Scheduled carriers satisfy the bulk of public needs for air transportation on the high density routes. The domestic trunk and regional airlines carried 156 million passengers between 479 points in 1970; this was accomplished with less than 2000 aircraft, each of which was operated more than 3000 hours per year. 2/

(2) Commuter (Scheduled) Airlines -- In 1970, the 161 small local airlines flew 690 aircraft an average of 1000 hours per year and carried 4.5 million passengers between 404 airports, of which 174 airports were served by them exclusively.

(3) Charter -- Charter services are being performed by scheduled airlines, supplemental airlines (using about 150 large jet transport aircraft) and by about 1900 air taxi operators who use about 3600 aircraft. 3/ Supplemental airlines meet special needs and air taxis provide flexible commercial service throughout the nation, filling the gaps left by the scheduled carriers.

(4) Corporate/Executive Aviation -- To accomodate the needs of business, 20,000 professional pilots and nearly 7000 aircraft are employed to extend the capabilities of middle and upper management of many major corporations. The corporate/executive fleet is tending toward large aircraft and more and more toward jet aircraft, i.e., the "biz jet". A majority of the corporate fleet is based at the tower controlled airports. 4/

(5) Personal Business Flying -Personal business flying is similiar to corporate/executive aviation in purpose; however, the aircraft are smaller and the principal traveler is also the pilot. Nearly 30,000 aircraft are operated in this category and only about one-third of these aircraft are based at the tower controlled airports.

(6) Personal Non-Business Flying -- This encompasses flying for personal or recreational purposes. There is a great deal of cross-over between personal non-business flying and business flying and the FAA uses the aircraft owner's declaration of primary purpose to differentiate between uses. Personal non-business aviation includes about 63,000 aircraft.

(7) Special Uses -- About one third of general aviation flying is for special purposes such as training, security (police and fire, etc.), industrial services (survey and mapping, pipeline patrol, etc.), and recreation and sport.

The aircraft noise problem is most often associated with two classes of aviation activity, the scheduled air carriers and corporate/executive aviation. This is to be expected since air carrier and some corporate/executive aircraft are the larger and noisier airplanes. Further, in order to perform their mission, these aircraft are usually operated from airports which are located in areas of high population concentration.

In 1973, the U.S. Air Line Fleet consisted of 2,583 aircraft of which 2,569 were turbine powered and 811 were 4 engine turbojet powered, 759 were 3 engine turbojet powered and 548 were 2 engine turbojet powered. 5/ 6/ As of the same time period, there were nearly 1,700 turbine powered corporate/executive aviation aircraft in operation. (All of the figures quoted above are exclusive of aircraft of foreign registry which may operate to and from U.S. airports.) As of December 31, 1972, there were 267 jet transport aircraft on order by domestic carriers; the value of these orders is in excess of 3.6 billion dollars. 7/

B. The U.S. Airport System

An airport is the interface between the air and ground transportation modes. It is also one of the most complex elements of the "aviation system", because it is the operation meeting ground for many of the regulatory policies which impact on and control aviation. The FAA lists more than 12,000 airports, heliports and seaplane bases, but public interest questions are centered on only a small portion of the total airport listing. Of the more than 7,000 airports which are open to the public, certificated carriers serve only about 500 and slightly in excess of 3,000 facilities are part of the National Airport System.

The National System of Airports consists of those public, civil and joint use (military/civil) airport facilities within the United States

and its territories which are considered necessary to provide an airport system which can anticipate and meet the needs of civil aeronautics. 8/ The configuration of the National System of Airports is, by law, periodically identified by the FAA.

Although the U.S. has about 4000 airports which are capable of accomodating some kind of reliable, scheduled air transportation, a full 70 percent of all enplanements are now handled by only about 27 facilities. 9/ In 1972, the Aviation Advisory Commission set about to determine the length of time that planned improvements could delay saturation at major U.S. Airports. Under the most optimistic of scenarios, the Commission determined that 23 out of the 27 of the country's busiest airports would become saturated sometime between now and the year 2000 if their growth were not constrained. The U.S. airport system is thus made up of a large number of airports, but the majority of aviation activity is concentrated at a very small number of airports. The lack of great volumes of traffic at most airports does not make them any less important to the National System of Airports, rather, it just serves to focus attention on those heavily used airports which now have or may soon have, major environmental problems.

C. Sources of the Airport Noise Problem

Three basic factors have caused the aviation industry to become associated with a rapidly escalating noise impact problem:

> First, the number of aircraft operations at many major airports has multiplied far beyond anything that was imagined when the airports were originally established. Airports such as Washington National, Boston-Logan, and Wold-Chamberlain (Minneapolis-St. Paul), for example, were located in the 1920's and 1930's to provide their communities with the closest, most convenient service possible on the limited air carriers of that era. Those locations were perfectly compatible with the surrounding area with the limited number and type of air operations for which they were envisioned; but they have become gradually less and less compatible over the years as the level of operations has increased.
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> Second, the noise impact took a quantum leap with the introduction of commercial jet aircraft in the early 1960's. Communities which never noticed the noise of propeller-driven aircraft were suddenly subjected to the impact of jet noise since then as commercial and, more recently, business jet operations have been spread to an ever-growing number of airports.
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> Third, many airports, such as Los Angeles International and Chicago O'Hare, were farsightedly located at an adequate distance from population centers but have since become encroached by new land developments. In part, this is due to the general growth which all urban areas have experienced over the last generation.

But in large part it is also due to the development pressure brought about by the airports themselves. Airports have become major centers of employment and economic activity as well as transportation. Except for noise, the areas around them are often prime prospects for residential and other developments because of:

(1) Proximity to air transportation, and to the employment and economic activity which it generates.
(2) The usual location of airports in the flattest, most easily developed areas.
(3) Availabilty of ground transportation, sewer, and other facilities installed to serve the airport.
(4) Proximity to the urban area which the airport was established to serve.

It is often stated, with some justification, that encroachment of incompatible development around airports should have been prevented by land use control authorities. But the problems of both encroachment and emissions present difficult dilemmas to the decision makers responsible for their control at the local level. On the one hand, local land use decision makers have the duty and responsibility to consider many factors in addition to noise in the development of land use plans and imposition of requisite land use controls, the most important of of which include fiscal solvency, the potential effectiveness of selected powers granted by restrictive state charters, and the constituents. The decision as to whether a particular tract of land should be developed, and the uses for which it is best suited is complex and justifiably political. The development may provide much needed housing, a more diversified economic base, or a very favorable revenue/cost ratio capable of alleviating a continuing burden on the public fisc. Within an economic trade area, restrictive policies in one jurisdiction will generally displace development to a jurisdiction with less restrictive policies. Entrepeneurs engaged in diversified development can exert considerable pressure on local decision makers, i.e., restrictive policies toward residential development can result in the displacement of tax rich commercial office and retail development to competing jurisdictions, not to mention the more obvious direct political pressures which may be applied.

The dilemmas are aggravated by the fact that most major airports are owned and operated by a number of political jurisdictions separate from many of the communities which are impacted by their noise. Noise from O'Hare International Airport, which is owned and operated by the City of Chicago, impacts Chicago among the least of the scores of communities which it affects. Noise from Los Angeles International Airport affects the City of Los Angeles much less than it does communities adjacent to the airport such as Inglewood. Such communities sometimes argue that it is unfair to expect them to restrict their growth and development because of another jurisdiction's airport. And whether this is "fair" or not, such communities could well point

out that in many cases they could not have adequately planned their development around the airport because they had no way of predicting (much less controlling) the rapid changes in the nature and scope of airport operations which have taken place. Finally, effective land use control around airports has been divided among many competing jurisdictions affected by the airport.

D. Scope of the Problem

One contemporary measure used to describe the magnitude of the aviation noise problem is the number of people exposed to some particular level of an equally particular noise scale. Although highly detailed estimates of impacted population, on a national basis, are not available, gross estimates do exist. For example, consider the following data:

Number of People (in millions) exposed to Day-Night Average Sound Levels, due to Aircraft operations, above the Stated Value 10/

Day-Night Average Sound Level, dB	Number of People Exposed
60 dB and above	16.0
65 dB and above	7.5
70 dB and above	3.4
75 dB and above	1.5
80 dB and above	.2

It should be noted that in Reference 10, it was also stated that complete elimination of aircraft noise in the urban area will still leave a large proportion of the population exposed to high levels of environmental noise unless control of non-aircraft noise sources is also obtained.

Additional data on the magnitude of the impacted population will be available this year from the DOT's Airport Noise Reduction Forecast Program. This study considers 23 major airports and addresses the magnitude of the impacted population to a very fine level of detail. However, the results for 23 airports cannot directly be used as a proxy for the magnitude of the national impact problem. Additional work is needed to determine a basis for estimating the impacted population around the thousands of small airports which are part of the total U. S. system of airports, especially those facilities which do not receive scheduled air carrier service. As noted elsewhere in the this document, only about 500 out of roughly 12,000 airports receive scheduled air carrier service and about two dozen of the 500 handle about 70% of all enplanements. This highly centralized distribution of activity gives rise to the following thought: Even though the impacted population around smaller airports may be very small, there are so many small airports, that, on a national basis, the total population impacted by

small airports may be very large. In an attempt to determine the magnitude of the impacted population around all airports, the EPA has embarked on a program to develop an estimating technique which is applicable to all classes of facilities. The estimating technique is a two part effort: (1) estimate the land area which is impacted by aircraft noise, as a function of airport activity levels, and (2) estimate the population density in the areas around the airport, as a function of urban form, distance from airport to population center, etc.

One often cited symptom of the airport noise problem is the almost complete stoppage of airport expansion in the more heavily populated parts of the country. Hand in hand with the halting of airport expansion is the increasing level of pending noise litigation against airports and the increasing value of noise litigation settlements.

The problems of specific airports, i.e., their own impasse, range from organized complaints to billions of dollars of litigation. For example, noise suits involving Los Angeles International Airport (LAX) have a total approximate amount in prayer of complaint of 4 billion, 800 million dollars and the amount of potential liability from all actions against LAX, those completed and those pending, is estimated at 2 billion, 500 million dollars. 11/ While LAX is probably the most sued of all U.S. airports, it is not alone and one has good reason to expect that, as in many other environmental matters, as California goes, so goes the country.

Other than suits to recover damages, the public concern about the environment has manifested itself in a whole new attitude about airports. For example, in Minneapolis-St. Paul recent candidates for posts on the Twin Cities' Metropolitan Airport Commission were campaigning on a platform that recommended closing down the airport altogether. This is a harbinger of the real impasse which is yet to come -- a desire on the part of the public to eliminate airports which, according to someone's perception, are not compatible with the community without any consideration of maintaining the levels of transportation service which the airport provides to the community.

E. Legal Resources and Ramifications

Prior to exploring alternatives and implementation strategies of a proposed airport noise regulation, it is appropriate to examine the relevant statutory and case law upon which the regulation will largely depend. The applicable statutes are the Federal Aviation Act of 1958, as amended, the Noise Control Act of 1972, and the Airport and Airway Development Act of 1970. Though the general mandate of the EPA in reference to noise control is covered by the Noise Control Act, when the area of concern shifts to aircraft and airport regulation, the Federal Aviation Act is the more pertinent and commanding statute. 12/ Enacted in 1958, this act has been amended several times. Cognizance of the Federal Aviation Agency (FAA) perspective must be taken at this point, however, for under its mandated author-

ity, noise abatement is only a single factor of many that must be considered. A chronological examination of the 1958 Act and its amendments will serve the dual purpose of clarifying the content and illustrating the trend of the law in these matters. For a more detailed explication of this discussion see the Environmental Protection Agency's Aircraft/Airport Noise Study Report, "Legal and Institutional Analysis of Aircraft and Airport Noise and Appointment of Authority between Federal, State and Local Governments," NTID 73.2 (July 27, 1973).

(1) The Federal Aviation Act of 1958

The Federal Aviation Act of 1958 (49 U.S.C. 1301, et seq., Public Law 85-726) is the statute under which the Federal Government regulates air commerce. Title III sets out the FAA Administrator's general powers and duties. Title IV sets out the Administrator's powers and duties related to safety.

Under Title III, the FAA Administrator has power to "prescribe air traffic rules and regulations governing the flight of aircraft ... for the protection of persons and property on the ground ..." (Section 307 (c)). The FAA has stated that it "considers (its) statutory authority (under section 307 (c)) adequate to prescribe rules restricting the pollution of the airspace by aircraft engines when that pollution has an adverse effect upon persons and property on the ground" (35 Federal Register 5264, March 28, 1970). This authority would logically extend to noise pollution of the airspace by aircraft engines.

Section 302 (a) of this title states that no Federal funds of any sort shall be expended upon the construction or operation of landing areas or facilities except upon the written certification of the Administrator. Section 309 states that even if no Federal funds are expended, no landing facility shall be established or altered without giving prior notice to the Administrator, pursuant to regulations prescribed by him.13/ The Airport and Airways Development Act (AADA), by way of an amendment to the 1958 Act, elaborates upon this certification procedure. The AADA amendment states that every airport serving civil air carriers must obtain an operating certificate from the FAA, the criteria including but not limited to "such terms and conditions as are reasonably necessary to assure safety in air transportation." 14/ The Administrator's power to certify an airport is explicit and exclusive -- as was the intent of Congress at the time. A more pertinent question for the purposes of this report is by what criteria does the Administrator issue the certification.

In the original 1958 Act there are two sections which are particularly relevant here. Section 307(a) states that "The Administrator is authorized and directed to develop plans for and formulate policy with respect to the use of the navigable airspace ... as he may deem necessary to order the safety of the aircraft and the efficient utilization of such airspace." 15/ Aircraft safety and airspace regulation is the area in which the FAA has its primary mission. The second rele-

vant section, Section 307(c), states that the Administrator is directed to prescribe air traffic rules for, inter alia, the protection of persons and property on the ground. "16/ Pursuant to these guidelines, the FAA has issued regulations concerning noise abatement in the form of takeoff and landing restrictions. One of the first airports so regulated was J. F. Kennedy Airport, with all airports with FAA operated control towers following in 1967.

It is clear from the above that as originally passed Title III of the 1958 Act authorized and directed noise abatement procedures under air traffic rules and flight regulation authority. Title VI of the same act, encompassing the general FAA safety powers and duties, was not so explicit in reference to noise abatement. It was not until the addition of Section 611 ten years later that any mention was made of noise abatement under this title. (Section 611 was added by Public Law 90-411.)

The purpose of Section 611 is to "afford present and future relief and protection to the public from unnecessary aircraft noise ..." The mechanism to achieve this relief and protection is the prescription by the FAA Administrator, after consultation with the Secretary of Transportation, of "standards for the measurement of aircraft noise" and the "prescription of such rules and regulations as he may find necessary to provide for the control and abatement of aircraft noise ..." The FAA Administrator is authorized to apply "such standards, rules and regulations in the issuance, amendment, modification, suspension or revocation of any certification authorized by this Title (VI)."

The 1958 Act was further amended by the addition of a new Section 612 in 1970 (Section 612 was added by the AADA, Public Law 91-258). Section 612 authorized the FAA Administrator to issue airport operating certificates to airports serving air carriers certified by the Civil Aeronautics Board. As noted, Section 611 authorized the FAA Administrator to apply "standards for the measurement of aircraft noise" and "such rules and regulations as he may find necessary to provide for the control and abatement of aircraft noise" in the issuance of any certificate authorized by Title VI. Such rules and regulations may be applied to airport operating certificates as well as to other certificates (airman certificate, aircraft type certificate, production certificate, air agency certificate) authorized by Title VI.

(2) The Noise Control Act of 1972

Until the Noise Control Act (49 U.S.C.A. 4901, et seq., Public Law 92-574) was passed in 1972, EPA was not directly involved in aircraft noise regulation. By the passage of the Noise Control Act, Congress instructed the EPA, inter alia, to study and make recommendations concerning aircraft and airport environmental noise conditions. It was the stated policy of Congress to promote for all Americans an environment free from noise which jeopardizes their health and welfare. Though the role of the local and state governments in this area

is significant, "Federal action is essential to deal with the major noise sources in commerce, control of which requires national uniformity of treatment." 17/ Congress was clearly concerned with the aircraft noise problem, for though the means were available to control the problem (as shown below), the airport noise problem was persisting. Section 611 of the 1958 Act was modified by Section 7 of the NCA from "relief and protection to the public from unecessary noise" to "relief and protection to the public health and welfare from aircraft noise". No longer is it sufficient to protect the public from unnecessary noise; relief must be such as to protect the public health and welfare. This crucial shift in criteria was evidentiary of Congressional concern with the public health and welfare.

The initial responsibility of the EPA under the Act in regards to aircraft and airport noise was to conduct a study of the adequacy of the FAA operational controls, noise emission standards, airport noise levels, and additional measures available to state and local governments to regulate aircraft noise. This study has been accomplished. 18/ In order to determine the levels that are necessary to protect the public health and welfare, Congress required the EPA Administrator to "issue criteria with respect to noise" and to "publish information on the levels of noise the attainment and maintenance of which in defined areas under various conditions are requisite to protect the public health and welfare with an adequate margin of safety." EPA has fulfilled that requirement by publishing two documents, the "Criteria Document" and the "Levels Document". 18/

The "Levels Document" states:

> "The levels of environmental noise identified in this report provide the basis for assessing the effectiveness of any noise abatement program. These noise levels are identified irrespective of the nature of any individual noise source. One of the primary purposes of identifying environmental noise levels is to provide a basis by which noise source emission regulations, human exposure standards, land use planning, zoning and building codes may be assessed as to the degree with which they protect the public health and welfare with respect to noise. Such regulatory action must consider technical feasibility and economic reasonableness, the scale of time over which results can be expected, and the specific problems of enforcement. In the process of balancing these conflicting elements, the public health and welfare consequences of any specific decision can be determined by comparing the resultant noise environment against the environmental noise levels identified in this report."

Congress desired that EPA, after completion of these studies, enter into a cooperative relationship with the FAA in the development of aircraft and airport noise regulations. Thus, Section 7 of the Noise Control Act requires EPA to "submit to the FAA proposed regulations to provide such control and abatement of aircraft noise and sonic boom

(including control and abatement through the exercise of any of the FAA's regulatory authority over air commerce or transportation or over aircraft or airport operations) as EPA determines is necessary to protect the public health and welfare." The FAA must publish such proposed regulations in a notice of proposed rulemaking within thirty days of the receipt from the EPA; and must commence a public hearing on them within sixty days. Within a reasonable time thereafter, FAA must either prescribe the regulations substantially as proposed or as modified by EPA, or publish in the Federal Register a notice that it is not prescribing the regulations together with a detailed explanation of the reasons for that decision. The Act then goes on to set out formal mechanisms to insure continuing interaction between FAA and EPA.

No proposed standards or regulations may be prescribed, however, without consideration of whether they are "consistent with the highest degree of safety in air commerce or transportation in the public interest", and "economically reasonable, technologically practicable, and appropriate for the particular type of aircraft, aircraft engine, appliance or certificate to which it will apply" in addition to other factors.

(3) The Airport and Airway Development Act of 1970

The Airport and Airway Development Act of 1970 (49 U.S.C.A. 1701, et seq., Public Law 91-258) provides for Federal aid to airport development projects (which include the location of an airport, an airport runway or a runway extension). Encompassing the process of application, hearing and approval at all levels for airport development projects is the declaration of national policy that "airport development projects ... provide for the protection and enchancement of the natural resources and the quality of the environment of the Nation." The Secretary of Transportation may not approve an airport development project found to have an adverse environmental impact unless he has issued a written statement that there is "no feasible and prudent alternative" and that "all possible steps have been taken to minimize" such adverse effects.

Thus, an airport development project may not be approved if there is an adverse effect on the "noise environment" unless there is "no feasible and prudent alternative" and that "all possible steps have been taken to minimize" the noise impact. As indicated in Citizens to Preserve Overton Park vs. Volpe (401 U.S. 402, 1971), a case involving a similiar requirement under Section 4(f) of the Department of Transportation Act, the Secretary's actions will be subject to substantial judicial inquiry.

Even if a project satisfies the needs of the local environmental conditions, it must also meet Federal substantive standards. Section 16(a) requires that all proposed development be "in accordance with standards established by the Secretary, including standards for site

location (and) airport layout ...." This allows DOT/FAA to prescribe standards for airport location, layout and improvements based on noise considerations.

Section 18, preserving a requirement of Federal law since 1964, provides that prior to approval of an airport development project the Secretary must have received satisfactory written assurances that "appropriate action, including the adoption of zoning laws, has been or will be taken, to the extent reasonable, to restrict the use of land adjacent to or in the immediate vicinity of airport operations." The Act further states that "No airport development project may be approved by the Secretary unless he is satisfied that fair consideration has been given to the interest of communities in or near which the project may be located."19/ "Fair consideration" shall be based upon criteria designed to "provide for the protection and enhancement of the natural resources and the quality of the environment of this nation." This language allows the issuance of land use guidelines for sponsors based in part on noise consideration.

The statutes above construct a firm foundation for the formulation of airport and aircraft regulations in regards to noise abatement. The 1958 Act insures the FAA Administrator the power to certificate airports and aircraft, and delineates quite clearly that one of the major factors to be considered is noise impact. The Noise Control Act demonstrates Congress's concern that consideration of the effects of noise be taken by all Federal agencies in their planning procedures. The Noise Control Act also mandates the EPA to create recommendations for aircraft and airport regulation and requires a prompt and formal consideration by FAA of these recommendations. The AADA has its most significant impact through its comprehensive emphasis upon consideration of environmental effects and land use planning.

The trend of the law has been to focus more attention and give greater weight to consideration of the secondary effects of the aircraft industry, i.e., upon people and property that are not directly involved as either proprietors or users. From the initial mandate of the 1958 Act, primarily concerned with aircraft safety, the emphasis has slowly been shifting to encompass many non-safety concerns.

4. Additional Agency Participation

Six other Federal agencies or departments also have authority to act in the area of aircraft/airport noise. The first is NASA, which has the authority to undertake research and development to abate aircraft noise at the source and to propose the results thereof to the FAA for incorporation in the Federal Aviation Regulations. Such research and development includes not only hardware items, design changes and model development, but also the software of noise abatement operating procedures.

The second Agency is the Civil Aeronautics Board (CAB), whose primary responsibility is to regulate the economic aspects of the airline industry. Though there is no explicit requirement in the enabling legislation for CAB to consider the environmental impact of its decisions, under NEPA this consideration has been mandated. Board functions include the issuance of certificates of public convenience and necessity authorizing an air carrier to engage in air transportation, the approval of mergers, and the regulation of air fares.

The third Federal entity is the Department of Housing and Urban Development (HUD), which has the authority and expertise to plan for and contribute to compatible land use in noise affected areas adjacent to airports and to advise on noise-resistant building constructions.

The fourth is the Department of Health, Education, and Welfare (and the National Institutes of Health), which conducts research on the health effects of noise. Fifth is the Department of Defense, which has a continuing program for compatible land use at military airports and which conducts research and development on technology for quieter aircraft and a certain amount of research on health effects of noise. Sixth is the Department of Labor, which, through the Occupational Safety and Health Administration, is authorized to promulgate rules concerning the levels of noise in the working area of employees, including those of an airport or an airline, whether their noise exposure occurs within or outside the aircraft.

HUD has taken action which will be helpful in the control of airport noise at the receiver. The HUD legislative authority contains no explicit provision mandating that HUD adopt regulations designed to protect the public health and welfare from aircraft noise. However, the Department of Housing and Urban Development Act of 1965 (42 U.S.C.A. Section 3521, et seq., Public Law 89-174), which created HUD, And The National Environmental Policy Act of 1969 implicitly provided authority for HUD to act. The Department of Housing and Urban Development Act declares that the general welfare of the nation requires the "sound development of the Nation's communities and metropolitan areas." The Secretary was given the authority to adopt such rules and regulations as were necessary to carry out the purposes of the Act. The National Environmental Policy Act of 1969 required all Federal agencies to develop procedures to carry out the purposes of NEPA.

In July of 1971, HUD promulgated Circular 1390.2, which established noise exposure policies and standards to be observed in the approval or disapproval of all HUD projects. The Circular cited the Department of Housing and Urban Development Act and NEPA as authorities. The Circular covers assistance for planning, funding new construction, and rehabilitation of existing structures. To be eligible for planning assistance, projects are required to take sufficient consideration of noise exposures and sources of noise so as to assure that new housing and other noise sensitive accommodations will not be planned

for areas whose current or projected noise exposures exceed the standards of the Circular. All forms of HUD assistance are prohibited for new dwelling units on sites which have or are projected to have unacceptable noise exposures. The Circular also provides that HUD is to encourage modernization of existing buildings for noise purposes so long as such modernization does not extend the useful life of the life of the buildings.

5. The National Environmental Policy Act (NEPA) of 1969

Superimposed on all Federal regulatory programs and major actions is the National Environmental Policy Act of 1969 (42 U. S. C. A. Section 4321, et seq., Public Law 91-190), which provides that "... to the fullest extent possible, . . . the policies, regulations and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act." This directs all agencies, such as the above cited Civil Aeronautics Board, to formally consider the environmental impact of a decision even though there is no requirement in the relevant enabling legislation with reference to environmental concerns. This formal consideration of environmental factors may often require the formulation of an Environmental Impact Statement (EIS). The EIS is designed to illuminate all facets of the agency decision making process, develop all possible environmental impact that will proceed directly or indirectly from the proposed action, and examine all possible alternatives to the action that might have different environmental impact.

In the instant case, all agencies that have some impact upon the lands around airports that are affected by aircraft noise have a duty of strict compliance with NEPA. Though the degree of impact and the possible solutions will still prove difficult for all concerned to assess and formulate, NEPA provides that all Federal agencies will "use all practicable means to . . . assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings."

6. State and Local Authority

To various extents, airport noise control efforts have been taken by state governments, local governments, and airport proprietors. The power of the state and local governments to control noise is derived from the police powers. The power of the proprietor to control noise is derived from his status as lessor. In most instances, airports are owned and operated by governmental bodies, in which case, the police and proprietary powers might be held to have commingled.

Conceptually, aircraft noise can be controlled at the source and at the receiver; theoretically, control can be exercised at both intervention points by proper authority. Legally, the power of a governmental entity to intervene to control noise at the source through its police power has been circumscribed by Federal preemption.

A series of court cases, culminating in City of Burbank vs. Lockheed Air Terminal, Inc., (411 U.S. 624, (1973)), has established the preemption of local governmental control of aircraft noise at the source. Locally imposed minimum overflight altitudes were held invalid in Allegheny Airlines, Inc. vs. Village of Cedarhurst (238 F. 2d 812 2d Cir., 1956), and American Airlines vs. City of Audobon Park (407 F. 2d 1306, 6th Cir., 1969). A locally imposed maximum noise limit for overflying aircraft was held invalid in American Airlines vs. Town of Hempstead (398 F. 2d Cir., 1968, cert. denied. 393 U.S. 1017 (1969)). A locally imposed curfew was held invalid by City of Burbank vs. Lockheed Air Terminal, Inc., supra. The essence of each case was that the attempted controls either directly or indirectly affected the flight of aircraft, which is controlled exclusively by the FAA under the Federal Aviation Act of 1958. The impact of the decisions is that control of aircraft noise at the source by state and local governments under the police power is invalid. However, the ability of the airport proprietor, as a lessor, to control noise at the source is unclear. The Burbank opinion left open the power of the airport proprietor to impose a curfew.

Given the relative lack of success of enjoining the operations of a noisy airport, nearly all other case law concerns either constitutional "taking" or "damaging". The landmark case is Griggs vs. Allegheny County (369 U.S. 84 (1962), which held that the local governmental authority, i.e., the airport owner, was liable for taking the aviation easement on the directly overflown property. Other cases have found that overflight was not necessary for liability for "damaging" property.

While control of aircraft noise at the source by state and local governments is invalid if an exercise of the police power, control of aircraft noise at the source by state and local governments is valid if accomplished as a part of an FAA regulatory plan. Further, local control of airport noise by intervention at the receiver is clearly not preempted and need not be done under Federal auspices. Such intervention is in the form of land use and building design controls. Aside from the three land use measures that have been traditionally available, several states have adopted an advanced and comprehensive approach to assure that there is some regional control over the area adjacent to airports other than the zoning authority.

Minnesota, for example, has adopted an Airport Zoning Act (Chapter III, 1969 Session Laws) that establishes state and regional airport neighborhood planning agencies. These agencies are respon-

sible for determining incompatible land use boundaries and for promulgating land use regulations that preclude development of incompatible uses and encourage the conversion to compatible uses in airport affected areas. California also has adopted a comprehensive land use planning program for airports (Title 4, Cal. Bus. Reg. Section 5000 et. seq.). The point to be made on the basis of the approaches taken by these two states is that compatible land use can normally be achieved only if a regional procedure is adopted so that there will be the necessary and uniform jurisdiction over all noise affected land surrounding the airport.

In states where comprehensive regional planning has not been or cannot be adopted under applicable state law, control of the impact of noise is dependent upon more traditional controls. The first consists of the zoning ordinances, to exclude incompatible uses in noise impacted areas. The second consists of a governmental unit acquisition of property by condemnation or purchase and the imposition of (similar type) limitations in its capacity as owner. And the third consists of imposing soundproofing requirements on residences located in noise sensitive areas.

7. Proprietary Authority

Port of New York Authority vs. Eastern Airlines (259 F. Supp. 745 (E. D. N. Y. 1966)), upheld the right of the proprietor to prohibit the use of a new runway until a second runway was completed. The Port Authority has also been able to withhold permission to use its airports from aircraft that produced more than 112 PNdB. The impact of Burbank on these restrictions is not clear. The airport operator may still be able to place conditions in its leases and contracts with airport tenants (including airlines) upon the use of airport property. Such restrictions may include restrictions on the types of aircraft which may use the airport, number of operations per day per lessee, hours of operation of the airport and noise limits to be complied with.

8. Constitutional Law and Preemption

Under the Constitution, Congress has the power to regulate interstate air commerce. There are facets of air commerce, however, that have been regulated by the states and have not been regulated by the Federal Government. The question that arises in regards to state regulation of an interstate industry is whether or not the state regulation places undue burden on interstate commerce. The Supremacy Clause holds the Federal Government supreme in interstate matters and has been interpreted to mean that where Congress has acted or where it has provided for Federal regulatory action, the "area" covered is said to be "preempted" so as to preclude any state or local action that conflicts with the Federal action.

This area of the law was discussed and briefed before the Supreme Court in City of Burbank vs. Lockheed Air Terminal, Inc. (93 Sup. Ct. 1854 (1973). The Court in Burbank reviewed a municipal ordinance that made it unlawful for a privately owned airport located within the jurisdiction of the municipality to permit jet aircraft operations between 11:00 p.m. and 7:00 a.m. The Court held that the Burbank was an invalid exercise of police power because the "pervasive nature of the scheme of Federal regulation of aircraft noise... leads us to conclude there is preemption."

In its rationale, the Court first cited two sections of the Federal Aviation Act of 1958. Section 1508 of the Act provides that "The United States of America is declared to possess and exercise complete and exclusive national sovereignty in the airspace of the United States..." Section 1348 gives the FAA authority to regulate the use of the navigable airspace, "in order to insure the safety of aircraft and the efficient utilization of such airspace... (and) for the protection of persons and property on the ground. The Court next analyzed the Noise Control Act of 1972 and concluded "that the FAA, now in conjunction with EPA, has full control over aircraft noise, preempting state and local control."

There can be no doubt that the holding in Burbank means that a state, or any political subdivision thereof, cannot use its police power to protect its citizens from aircraft noise - if the police power action attempts to regulate the source of the noise. This of course, raises the question of whether the airport owner may exercise its own proprietary right to control the noise of aircraft using its airport. This question was purposefully left open in a footnote in the opinion. The text of the footnote is as follows:

> "The letter from the Secretary of Transportation... expressed the view that "the proposed legislation will not affect the rights of a state or local public agency, as the proprietor of an airport, from issuing regulations or establishing requirements as to the permissible level of noise which can be created by aircraft using the airport. Airport owners acting as proprietors can presently deny the use of their airports on the basis of noise considerations so long as such exclusion is nondiscriminatory." (Emphasis in opinion) "Appellants and the Solicitor General submit that this indicates that a municipality with jurisdiction over an airport has the power to impose a curfew on the airport, notwithstanding Federal responsibility in the area. But, we are concerned here not with an ordinance imposed by the City of Burbank as "proprietor" of the airport, but with the exercise of police power. While the Hollywood Burbank Airport may be the only major airport which is privately owned, many airports are owned by one municipality yet physically located in another. For example, the principal airport serving Cincinnati is located in Kentucky. Thus, authority that a municipality may have as a landlord is not necessarily congruent with its police power. We do not consider here what limits if any apply to a municipality as a proprietor."

It is not clear what authority a municipality has as proprietor of an airport, but it is clear that the municipality, as proprietor, is liable for noise created by airport traffic and has, in the past, been sued on the basis of such noise.

The case law defining private rights and remedies for aircraft noise has thus influenced the allocation of authority between state government, local government and airport owners to deal with the aircraft noise problem. Given the relative lack of success of enjoining the operations of a noisy airport, nearly all of the case law concerns either a damaging or constitutional "taking". The "taking" cases repsent the so-called Federal rule, which originates with the decisions of the Supreme Court in United States vs. Causby (328 U.S. 256 (1946)) and in Griggs vs. Allegheny County. (369 U.S. 84 (1962)). The Causby case announced that the Federal government (apparently as a partial lessor of the Winston-Salem Airport rather than as the operator of the military aircraft in question) had in the constitutional sense "taken" an interest or "aviation easement" in the property the aircraft overflew. Because of this, the United States was required to pay just compensation under the Fifth Amendment to the Constitution, the measure of damages being the diminution in the value of the overflown property. Some ten years later in the Griggs case the Supreme Court had before it an airport which was owned by state authorities, was used by commercial aircraft, and had flight patterns which were regulated by Federal authorities. It was clear that there could be no taking in the constitutional sense by the commercial carriers who used the airport and generated the noise. The Court held that the local governmental authority, i.e., the airport owner, was liable for taking the aviation easement on the directly overflown property.

Since both Causby and Griggs involved direct overflights, the theory of these cases has been called the trespass theory of inverse condemnation which requires the actual physical invasion of the property, i.e., the air above the ground. This direct overflight approach has not been frequently followed in those state courts whose constitutions bar not only governmental takings but also governmental damaging unless there is just compensation. Those jurisdictions have allowed recovery against the governmental airport owner on a broader rationale that does not require overflight.

The point to be made here is that the power still left with the states and local governments to achieve aircraft noise abatement at the source appears to be their right as property owners to defend themselves from liability and to keep their air terminal systems viable. They also continue to have the power to control exposure to aircraft noise through land use control and building design.

II. The Solutions Available

In the airport noise problem, as in any other community noise problem, the appropriate remedial or preventive actions to be taken depend upon a variety of factors. However, for each specified quality criterion or "level of protection" under consideration (and no matter which of these values may be finally adopted as a short- or long-range goal), the most cost-effective "solution" for each situation is always a mixture of options. Often this is true of the most effective solution, as well, even prior to consideration of cost.

The traditional way of looking at any noise abatement problem - whether it involves children in a schoolroom, to be protected from highway noise; workers in a factory, to be protected from machinery noise; or any other "scenario" - is to simplify the scenario into three basic elements: (1) the noise source, (2) the propagation path between noise source and "receiver," and (3) the "receiver" of the noise, who is to be protected, Figure 1. In this traditional "source-path-receiver model," the propagation path is usually defined to include everything between the noise source and the (human) receiver that can have an effect upon the noise level at the receiver. Hence, the "path" part of the model includes sound propagation distance; any hills, walls, rows of buildings or other sound-attentuating elements. If the "receiver" is indoors, the "path" includes the noise reduction (exterior-to-interior noise level difference) afforded by the building's exterior shell. If the "receiver" is wearing ear plugs or "ear muffs" such as worn by workers in extreme noise environments, they are a part of the "path" of the sound, too.

The human "receiver(s)" play no active role in this model; they simply represent the composite result of human physiological and psychological characteristics, including activities with which noise may interfere, leading to the numerical values of noise environment limitation which would be desirable, prior to consideration of conflicting factors such as economic costs.

The elements of the model upon which intervention is possible are at the source and in the propagation path. Examples of typical physical interventions (and the corresponding legal/regulatory actions which might be used to require them) are shown in Figure 1.

In the entire history of noise abatement studies and programs, it has been the case that little is accomplished, sometimes in spite of large expenditures of money, unless a comprehensive approach is taken which considers all the elements of this "model" and their relationship to each other. Reduction of noise output at the source is usually of great importance, since for any specified exposure criterion level or limitation goal, very large reductions in the amount of land area (and hence people, dwelling units, etc.) accompany each 10 decibel or even 5 decibel reduction in source noise characteristic. This is true regardless of whether the "source" is a point source (such as a stationary noise source in a community), or a line source (such as a freeway) or a complex source (such as the total aviation activity at an airport).

This results simply from the geometry and sound propagation physics of the situations involved.

However, if one places total emphasis on source noise control, to the exclusion of "path" control actions, a point of diminishing returns is reached, where each additional reduction in source noise emission becomes increasingly more difficult and costly to obtain. Most machines cannot be made totally silent, nor even quiet enough to allow neglect of "path" control actions. This is certainly true of aircraft; even if it were somehow miraculously possible to propel them without any engines at all, there might still be a significant remaining noise problem, for very nearby communities, simply from the aerodynamic noise generated by their movement through the air - this can be confirmed by riding in a sailplane!

Hence, we are left with the necessity (which becomes even more evident when cost-effectiveness studies are done) of accompanying our source noise control efforts by good transportation and community planning, land use controls, designation of "noise insulation districts" where building design and construction must meet noise insulation codes, and so on. It should be evident that costs associated with such measures will be much smaller in the case of new development than where remedial measures are required, but there are numerous historical cases which prove the point.

In the case of community noise from aviation activities at an airport, the conceptual model can be further simplified, as shown in Figure 2. The model has been reduced to two elements, one representing the noise exposure environment produced by the aviation activities, and the other representing the "receiver community." In this model, the total activity at an airport is viewed as comprising a noise source, the magnitude and directivity pattern of which are determined by:

- The noise characteristics of specific aircraft types, *
- The application of noise abatement operating procedures, **
- The proportion of the flight operations occurring at night,
- The types of aircraft utilizing the airport, ***
- The frequency of flight operations (by aircraft type).

* Appropriate subjects for Federal aircraft noise emission regulations.

** Appropriate subject for Federal aircraft flight procedure regulations.

*** Appropriate subject for restriction by the airport owner, particularly if supported in such action by a Federal regulation.

- The runway orientations and flight paths utilized by the aircraft as they approach and depart from the airport.

These are the basic ingredients of every valid scale for quantifying community noise exposure from airport operations, developed from twenty years of field and laboratory research in this country and others (see Appendix D and its references). From the necessary input data, using such scales, one can calculate the magnitude of the noise exposures as a function of geographic location.

Even where there is "noise exposure," there is not "noise impact" unless there are people present, in communities around the airport, engaged in noise sensitive activities; and the level of the exposure is above some threshold value where interference with those activities occurs. The amount of "noise impact," therefore, is a function not only of the above listed components of aviation activity, but also of the surrounding land use patterns. Included in the term "land use" as used herein are (1) degree of noise sensitivity of various land uses (e.g., residential, commercial, industrial) according to the types of human activity wich normally occur there, and (2) for those land uses where only indoor activities are of importance, the noise insulation characteristics of the buildings' exterior shells.

The prevention or decrease of noise impact from aircraft noise associated with airport activity therefore requires:

(a) Making aircraft inherently quieter and having them flown as quietly as possible.

(b) Designing or modifying the total operating plan of the airport so as to minimize the extent of the airport noise impact zone and tailor its shape to avoid existing noise-sensitive land uses where possible.

(c) Preventing buildup of new housing or other noise-sensitive land uses in present and anticipated future noise zones and, where necessary, resolving by land use measures (soundproofing or conversion) those few impacted areas where the noise exposure cannot be adequately decreased by other means.

There simply are no other physical actions possible that are not encompassed within one of these three general categories.

The conceptual model symbolized in Figure 2 is also convenient for crystallizing one's thoughts regarding one of the primary reasons why there has been no solution to the airport noise problem thus far - and why there is presently no real way to get a solution: the fragmented institutional arrangements. On the one hand, Federal agencies are able (if they would) to control the aviation side of the problem. On the other hand, local governments are able (if they would) to control the land side of the problem. Airport proprietors and noise impacted communities

are caught in the middle, the former able to do a great many things to limit the noise exposure but not to control the land uses, yet bearing the total legal liability for property "taking" and "damaging" from aviation noise from their facilities; and the latter unable to do much of anything except bring suit.

Nowhere is there a single entity that has complete capability to cover both halves of the problem, for either remedial or preventive purposes, even though a very large amount of improvement appears technically and economically feasible (over a reasonable time scale). What appears to be needed is a joint Federal-state-local program, under a Federal umbrella, to coalesce all the elements of "solution" for each airport/community situation. That is the purpose of a Federal airport noise regulatory program.

The objective of these (EPA) efforts is to develop an appropriate and effective set of institutional/regulatory processes which (when combined with an aggressive Federal program of aircraft noise regulations) will form a framework within which all parties (including the Federal government itself) can - and will be motivated to - work together to reduce existing noise impact situations and prevent new ones.

THE ELEMENTS OF PREVENTION/SOLUTION

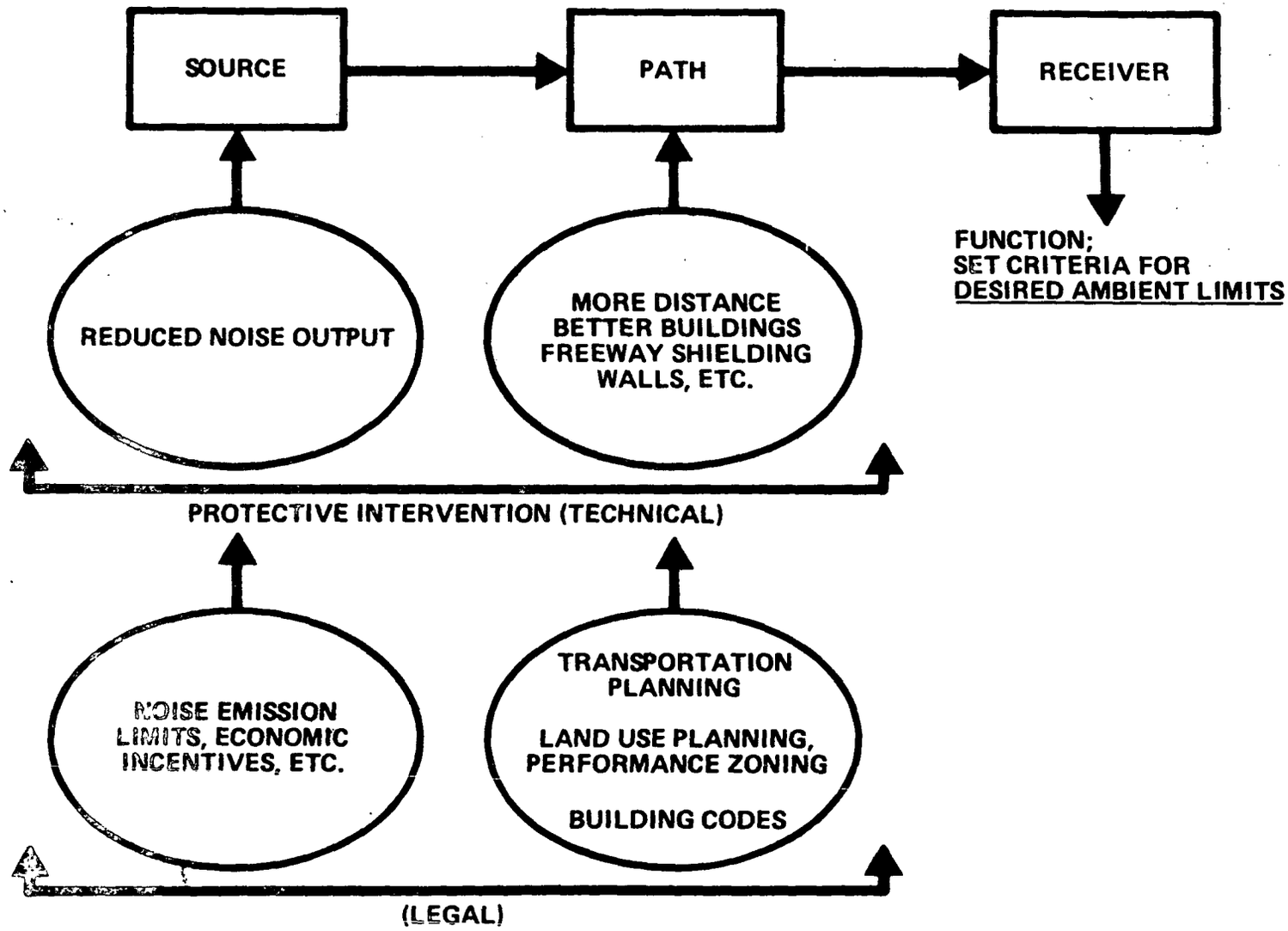

Figure 1

"SURROUNDING THE PROBLEM"

WITH AN AIRPORT NOISE REGULATION PROGRAM

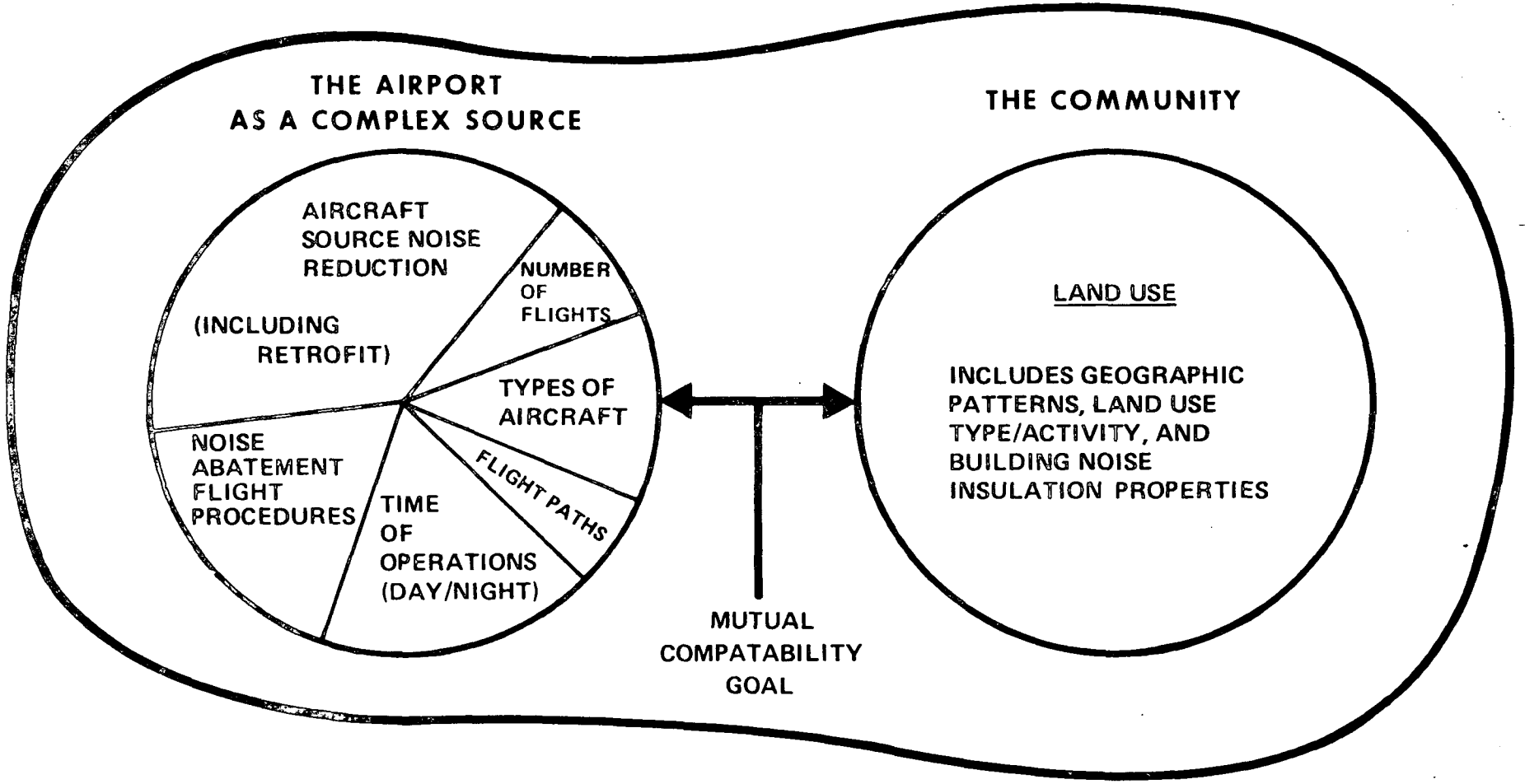

Figure 2

III. The Need For and Objectives of an Airport Noise Regulation

Having now examined the legal context within which action must take place and the possible courses of action, it is appropriate now to determine in what manner these three options discussed above will be meshed to create satisfactory solutions for individual airports. An examination of the political and economic decision making processes will illustrate some of the complexities of the proposed airport program.

A. The Need for a Decision Making Process for Each Airport

As discussed above, there are three general ways to reduce or prevent noise impact at any airport:

(1) use of quieter aircraft;
(2) changes in flight patterns, schedules, and other aspects of airport operations; and
(3) land use control and conversion around the airport to prevent and correct incompatible land uses.

There are no other options.

If any one of these options, or any combination of them, could be termed in some sense the "best" answer to the problem for all airports, the development of an airport noise regulation would be vastly simplified. It would require only the application of technological expertise in a manner not unlike that by which our society has found innumerable solutions to isolated problems, from designing highways capable of moving large numbers of vehicles safely at high speeds to landing men on the moon.

The airport noise problem, however, is not susceptible to a general solution. No technological breakthrough in any of the three types of options which would eliminate the problem is likely. Each type of option can, however, provide varying degrees of relief. Optimum noise abatement can therefore be achieved only by the application of some combination of these three types of options. But the particular options called for depend to a great extent upon factors which are different at each airport, such as the physical characteristics of the surrounding land and the distribution of the neighboring population.

The problem would still be relatively simple if the only complicating factor were the differences between airports. A "best" solution could then be found for each airport. Applicable models could be developed which would provide the solution for each airport based upon its particular data. The required process would be no more complex conceptually than the process which has existed by which generally applicable principles of highway design have been used to design highways for particular locations.

But unlike the problems of highway design and space travel, which have in the past have been reduced to simple absolute quantities such as vehicles per hour or orbital velocity, airport noise unavoidably concerns directly the health and welfare of individuals and their economic well-being. While these factors can be quantified to some extent, they cannot be weighed against each other according to any universal formula. They are intimately bound to the unique values and goals of individuals, and the trade-off or resolution between them when they come into conflict is therefore best made by each individual for him (or her) self. Where the required resolution is of such a nature that it cannot meaningfully be made at the individual level, democratic ideology requires that it be made in a manner which will allow each concerned individual to arrive at his or her own judgement as to proper resolution and give that judgement fair consideration. Decisions made in such a manner are accepted not because they are regarded as the "best" solution to the problem under consideration according to any universal formula, but because they are regarded as representing a fair resolution of inevitably conflicting interests and values.

There is no "best solution" to the noise problem at any airport, in the sense of a solution which would be acknowledged as "best" by all concerned. Any combination of noise abatement options will help different individuals who are affected by the noise to different degrees; and some options might even increase the noise exposure of a minority of those affected. Individuals who are not impacted at all by the noise from the airport will be variously affected by the different economic impacts of the noise abatement options. Even if everyone concerned were affected to the same degree by the same health and welfare and economic impacts of the possible noise abatement options, they would not agree as to a "best" solution because their values regarding health and welfare and economics differs. The "best" solution for the noise problem surrounding any airport can, therefore, only be one which in some agreed upon sense represents an optimal resolution of the conflicting interests and values involved.

Until now, there has been no mechanism to bring about any such resolution for any airports. The remainder of this section will discuss how the airport noise regulation might be structured to create such a mechanism.

The need for such a decision making mechanism is independent of the noise abatement options which might be brought to bear on the noise problem facing a given airport, of the tools which might be used to help evaluate the effects of possible options before a decision is made among them, and of the means by which a decision as to the best "mix" of options might be implemented and enforced. The noise abatement options involving aircraft design and flight procedures are the subjects of separate studies being conducted by both EPA and FAA.

B. Decision Making Through the Economic System

(1) The Market Theory

The mechanism by which our society has resolved most of its conflicts among various possible courses of action is the economic market system. In theory, whenever there is not enough of a given commodity to satisfy all of those people who desire it, a market will develop in which the price of the commodity will reflect the supply of it and the aggregate demand of all people for it. Individuals desiring that commodity can then decide for themselves whether they desire it enough to pay that price.

Since the price relates to the supply and demand for the product, this amounts to a decision by the individual as to whether his desire for the commodity is as great or greater than the desire of others for the commodity, given its available supply. But since individuals have limited resources with which to buy commodities, a decision by an individual to satisfy his desire for one scarce commodity will preclude his ability to satisfy his desire for some other commodity. Each individual must therefore decide on an allocation of his limited resources which optimizes the satisfaction of his desires for the various scarce commodities available. Since the market for all scarce commodities is the composite of such decisions on the part of all individuals, it represents an optimum allocation of all scarce commodities to maximize the amount of satisfaction in the society. And, since every individual is regarded as being free (at least within the limits of his resources) to decide for himself which of his desires to fulfill and to what extent to fulfill them, the market system of allocation of resources is regarded as the closest possible approximation to the democratic ideal of letting everyone live according to his own values.

(2) Application of the Theory to Airport Noise

Airport noise has now become so prevalent in many areas that "quietude" can accurately be regarded as a scarce commodity. The things which might be affected to varying degrees by the possible options to reduce airport noise and thus increase "quietude", i.e., the convenience and cost of air transportation and the economic benefits which airports bring to communities, can also be described as scarce commodities. In theory, therefore, a market system ought to be capable of determining a "level of quietude" which is "optimum", in the sense of representing the compromise between noise abatement options and the effects of the implementation of those options on aviation and the benefits brought by aviation which will maximize the total well-being of the community. The "natural law" of economics would thus serve as the decision-making "model" which would determine the "best" solution for each airport.

Professors William F. Baxter and Lillian R. Altree have described how a theoretical system could achieve such a resolution of the airport noise problems ("Legal Aspects of Airport Noise", -- Journal of Law and Economics, 1-113, March, 1972). If all of the land impacted by noise from an airport, and the airport itself and the airlines and aircraft operating therefrom, were owned and operated by a single entity, and that entity was motivated by a desire to maximize the income from all of its holdings, it would manage its holdings so as to achieve an "optimum" level of noise impact. It would do so because the noise impact would represent a cost to the entity, in terms of reduced potential income from its noise-impacted land holdings, which could be weighed against the cost of implementing various possible noise abatement options to reduce the impact. Land use options, such as limitations or conversions to noise-compatible land uses or addition of sound insulation, would be undertaken to the extent that they were justified by resulting increases in income from those properties. Similarly, changes in airport operations, scheduling, and aircraft to reduce noise would be implemented to the extent that the increased cost (or decreased revenue) in airport/aircraft operations brought about by the change were offset by increases in income from land which was freed from noise impact by the change. Conversely, changes in operations which would increase noise impact, such as addition of more or noisier aircraft using the airport, would be implemented only if the resulting increase in airport revenues offset the decrease in land revenue brought about by the added noise.

The key feature of this "unified firm" concept which would theoretically bring about these results is the establishment of a direct relationship between the cost of abating airport noise and the benefit of the abatement. In other words, those in a position to abate airport noise would have an incentive to do so, to an "optimum" or cost-effective degree, since they would directly realize the benefits of the abatement. The economic system would "automatically" lead airport operations to an "optimum" level of allocation of all of the "scarce commodities" consumed by those operations, including "quietude", since the beneficiaries of the airport would be paying all of the costs of the benefit received - including the cost of noise.

The only mechanism existing at present to transfer the cost of airport noise from airport neighbors to the users of aviation is the courts, through the device of constitutional taking or damaging or nuisance suits. But the irrational rules of recovery used make the courts an extremely limited cost transfer mechanism. Even if the rules were rationalized, the courts are so inefficient for making large scale transfer of costs that the theoretical "market" for quietude would not function.

Recognizing the limitations of the courts and the extreme practical difficulties involved in creation of a "unified firm", Baxter and Altree propose an alternative mechanism for effecting a transfer

of the costs of airport noise from airport neighbors to the users of the airport. A government agency of some sort would periodically assess the level of noise impact of each airport, in terms of the decrease in market value of the impacted land brought about by the noise. The airport operator would then be required to make payments to all of the owners of noise impacted land to compensate for that decrease. In exchange for the payments, the airport would receive easements giving it the right to impose noise on the properties. The payments and the resulting easements would be limited to the time period before the next assessment of noise impact. At the time of that assessment, the required payments for the next period would be adjusted up or down in accordance with any increases or decreases in noise impact.

Airport operators could pass these required payments on to the passengers who benefit from air service, either directly through head taxes or indirectly through increases in aircraft landing fees which could be passed on by the airlines to the passengers through increases in ticket prices. The market system would then theoretically create incentives for all the parties involved to act in such a way as to bring about an "optimum" level of noise impact, produced by the "right" mix of changes in aircraft design, aircraft and airport operating procedures, flight schedules, and land uses to maximize the well-being of the community. Those individuals who would remain subject to some level of noise would supposedly have no complaint, since the compensation for that noise impact would be presumed to put them on an equal basis with all others in the society to decide for themselves whether the benefits of living near the airport outweigh, in their personal scale of values, the detrimental impact of that level of noise on their health and welfare.

(3) Limitations of the Market Theory for Airport Noise

Useful as the market system is for resolving many problems of resource allocation, some of its basic assumptions as well as its practical limitations make it inappropriate for use as a decision making mechanism for the airport noise problem:

a. The nature of noise impact

First, the market theory rests on the assumption that individuals can make more or less conscious judgements as to an appropriate resolution, for them, between the benefits of living near airports and the impact of noise on their health and welfare. They are thus presumed to have no reasonable complaint with the noise, if only a compensation mechanism is established to put them on an equal footing with others in the marketplace for places to live.

But experience with the limited compensation mechanism presently offered by the courts indicates that individuals do not regard monetary compensation as a "fair exchange" for the noise to which they are subjected. They seem much more desirous of stopping the noise altogether. Failing that, they of course accept whatever amount of monetary damages they can recover. But they apparently regard the money as a windfall rather than as a real exchange of property rights for value, since even after obtaining money damages they continue to regard the airport with equal animosity and continue to use whatever political means are available to oppose it.

It is altogether understandable that this is the case. The real impact of noise is not upon property values, as presumed by the market theory, but upon the health and welfare of individuals. Property values are affected only incidentally, as a result of the effect on health and welfare. Indeed, in most instances the value of property (at least for non-residential uses) is increased by its proximity to an airport and by increases in airport operations, in spite of the noise. The most basic fallacy in the legal treatment of airport noise as a case of past or present taking or damaging of property, is the fact that it ignores the future damage that continuing noise will do to the health and welfare of individuals. In other areas of law money damages are regarded merely as the best available compensation for past harm, not as an adequate remedy for preventable future harm. Our society does not regard money as a fair exchange for damage to individual health and welfare. Money is merely the only available compensation for damage which has already occurred and is therefore unavoidable.

Even if money were a fair exchange for harm to individual health and welfare, it would be impossible for any individual to make a meaningful trade-off between the advantages to him of living near an airport and the harm which the noise from the airport might do to his health and welfare. The harm to health and welfare caused by various levels of noise is presently known only in the statistical sense of harm to public health and welfare. It is known that certain levels of environmental noise should not be exceeded if the health and welfare of the public as a whole is to be protected, and that if those levels are exceeded some individuals will suffer detrimental effects. It is not possible to predict in advance which individuals will suffer what degree of harm. Individuals therefore cannot make a meaningful assessment of the impact airport noise might have on them, or make a meaningful trade-off between such an assessment and other factors in deciding where to live. This is true even if they are knowledgeable about the effects of noise.

b. Limited Freedom of Action by the Parties

Second, the market theory assumes that the economic incentives which a market would create would lead the various parties to the airport noise problem to take appropriate action. This assumes, in turn, that the parties are capable of taking such action. But the parties to the airport noise problem do not have freedom of action.

Airport proprietors, for example, have no ability to modify flight procedures or (unilaterally) to modify flight paths to abate noise since those procedures are completely regulated by the Federal Aviation Administration. It is unclear to what extent airport proprietors have any authority to modify aspects of their operation other than flight procedures, such as schedules and types of aircraft allowed at an airport, to abate noise.1/ Airlines are similarly constrained by pervasive Federal regulations. People using land impacted by airport noise, on the other hand, are limited in their ability to deal with airport noise by the present unpredictability of changes in airport operations which might increase noise and by their fixed investments in noise impact areas; as well as by the nature of noise impact discussed above.

In short, the airport noise problem is not continuing because of any absence of incentive to solve it. The existence of opposition to noise intense enough to virtually halt airport expansion across the country, and billions of dollars of law suits based on noise, are incentive enough. What is lacking is a mechanism capable of considering and resolving the various types of interests (economic and non-economic) affected by the problem, and capable of carrying out that resolution.

C. Decision Making Through a Political Process

(1) The Political Process

The airport noise problem is far from being the only one which our society has faced which could not be resolved in purely economic terms. Virtually all questions affecting the health and welfare of people, from education, to medical care, to safety in air transportation, are beyond the realm of economics because they unavoidably involve value judgements about the importance of the health and welfare of individuals which cannot be quantified.

Most such questions are resolved by some mechanism which permits the interjection into the decision-making process of such non-quantifiable values. These are broadly termed "political" processes. They include popular referendums, elected decision-making bodies such as legislatures, and processes such as administrative procedures which are created by elected bodies and are answerable to them.

Since the value judgements involved in such questions can only ultimately be resolved by each individual for himself, the decisions made by political processes are seldom accepted universally as the "best" answer to the questions. The decisions are accepted, nevertheless, because they are viewed as giving fair consideration to the

separate values and interests of all concerned. They therefore represent the best solution of problems which cannot meaningfully be answered at an individual level or by some universal mechanism such as economics.

(2) Complete Decision-Making at the Federal Level

The most readily available political process which could be used to find answers to the airport noise problem is the rule making procedure of the Federal Aviation Administration. Existing law clearly gives the FAA authority to regulate aircraft design, flight procedures, and airport operations for purposes of noise abatement as well as for purposes of safety. The FAA could therefore take it upon itself to develop a plan for controlling the noise problem at every airport in the country. The various parties whose interests and values would be affected by such plans, including airport operators, airlines, pilots, local economic interests benefited by the airport, airport neighbors, and environmental groups, could raise their separate concerns and judgements through the normal rule-making processes guaranteed by the Administrative Procedure Act.

The FAA does not, however, have any authority to make decisions regarding land use around airports. The decision-making process offered by its normal rule making powers and procedures is, therefore, incomplete to deal with the total airport noise problem. It can only deal directly with the half of the problem which involves possible modifications to airport operations, flight procedures, and aircraft design; leaving the land use options untouched.

This problem is only the most severe manifestation of a more basic problem with developing noise control plans for each airport at the Federal level. It is a basic tenet of our society that decisions affecting individuals should be made by a mechanism which is as close to them as possible, so as to reflect as strongly as possible their judgement as to what the decision ought to be. This is the basis for the strong commitment throughout our history to local government. A corollary of this tenet is that, where possible, decision-making processes ought not include directly the judgements of individuals who are not directly affected by the decision.

While some decisions affecting the aircraft noise problem are national in scope and can effectively be made only at the Federal level, many decisions regarding the noise problem at particular airports will have no direct effect on individuals in other locations. This is especially true of land-use decisions but it is also true of decisions regarding changes in flight procedures and airport schedules and operations at least insofar as those changes are consistent with a safe and

efficient national system of air transportation. It would be unfair to the people in the local communities which will feel almost all of the effects of such decisions for them to be made through a process (like the normal FAA rule making procedure) designed to give their judgements only equal weight with the judgement of other people who will be only peripherally (or not at all) affected by those decisions. And because such a process would not be designed to give fair weight to the judgements of the individuals most directly concerned with its decisions, those decisions could not be said to represent the "best" resolution of the conflicting interests and values involved.

Quite aside from considerations of available authority and fairness to affected individuals, it would be a mammoth burden for the FAA to undertake to develop complete noise control plans for every airport by itself. Such a task would require FAA to duplicate much of the knowledge and capability which is already in existence at the local level. It would be much more efficient for individual airport proprietors and representatives of noise impacted communities to work out between themselves the best answers to the questions that concern only their particular airport and communities.

(3) Complete Decision-Making at the Local Level

If all of the above is true, then why should not the airport noise problem (or at least those aspects of it affecting primarily individual airports and communities) be left entirely to airport proprietors and noise-impacted communities to work out between themselves?

The short answer to this alternative is that the law does not allow it. Congress and the courts have concluded that all aspects of aviation, including noise, are of such nationwide concern and impact that (with the possible exception of the airport proprietary power, if any, noted in the Burbank opinion) only the Federal government can appropriately regulate them. Aviation is, therefore, the subject of "pervasive" and "complete" Federal regulation.

This conclusion is not without justification. Aircraft design requirements can only be dealt with at the national level; and all aspects of safety and efficiency in air transportation are certainly of nationwide concern. Decisions regarding changes in flight procedures and airport operations and schedules for purposes of noise abatement, although not inconsistent with considerations of safety and efficiency of air transportation, are nevertheless inseparable from them. It is therefore quite appropriate that the law allows only the Federal government to enact regulations on aircraft design, flight procedures, and airport operations. Because only the Federal government can regulate those aspects of the airport noise problem involving aircraft and airport operations,

local authorities cannot adequately deal with those aspects of the problem involving land use. Like the FAA, their authority only covers half of the problem.

D. Joint Federal-Local Decision Making Roles

1) Role of the FAA:

a. Authority

As noted above, the Federal Aviation Administration alone has the regulatory authority to order changes in aircraft design, flight procedures, and airport operations for noise abatement. The focal point of a process to resolve the airport noise problem must therefore be FAA rule-making procedures. Those procedures can be shaped by the FAA, however, so as to give appropriate roles to local and national inputs regarding local and national aspects, respectively, of the airport noise problem.

b. Aircraft Design

One part of a total process to resolve the airport noise problem has already been implemented by the FAA. The normal rule-making procedures (as augmented by the Noise Control Act of 1972) have been and are being used to determine, at the national level, appropriate noise emission standards for new and existing aircraft. This aspect of the problem is purely national in scope; and the normal rule-making process is intended to give fair consideration to all of the national interests involved. Airlines, aircraft manufacturers, pilots, national environmental groups, and airport and local government officials (in their roles as national interest groups) are all entitled to present their comments on the proposed rules in the same manner. While reasonable people might differ over whether FAA is the best body to make these decisions, there is little doubt that they should be based almost entirely upon nationwide concerns (both for aviation and for the environment). Individual airports and communities should be heard only insofar as they represent general concerns, and not with regard to their unique problems.

c. Flight Procedures

The same process should be followed in designating a set of flight procedures for noise abatement which are consistent with safety. The problem here is to determine which possible noise abatement flight procedures are consistent with safety. The answers to that problem, like the problems of aircraft design, turn on technical aspects of aircraft operation which do not vary from place to place. Like the answers to problems of aircraft design, therefore, they should be sought on a

purely national level. Inputs to the questions involving safety and effectiveness of noise abatement flight procedures should be received on an equal basis from all who can shed light on the subjects, without regard for unique problems of particular localities or groups.

The normal rule-making process of the FAA, as augmented by the Noise Control Act of 1972, is intended to serve these purposes.

d. Implementation Plans for Individual Airports

The choice of a particular set of noise abatement options for a particular airport, while having national implications, is a matter which much more directly affects the unique concerns of the individuals whose livelihood and lives are directly related to that airport. The FAA should therefore use its existing authority over aircraft and airport operations to create a process for the development of individual airport noise control plans which gives first consideration to the judgments of the people (or their representatives) who will be directly affected by such plans, limiting those judgments only by the necessity that the individual airport plan be consistent with the national aviation system.

This could be accomplished by a new FAA regulation, issued under the authority of Title VI of the Federal Aviation Act of 1958, as amended, which would incorporate the following features:

(i) A requirement that all airports have a noise control plan as a condition of operation. Such a plan would at least include all of the noise control options involving airport and aircraft operations and required acquisition of property rights by the airport, which are decided upon by one of the means outlined in paragraph (iii) below. It might include as well the options involving land use control by local jurisdictions. But if it did include the latter types of options, it would have to "include" them in a different sense from the former; since in contrast to the FAA's pervasive authority over aircraft and airport operations, the only authority which FAA possesses to make or enforce decisions regarding land use control options is that which is related to future AADA grants.

(ii) A specified procedure for the development of such a plan. This procedure should include means by which the judgements of all affected or concerned persons as to what the plan should contain can be included in its development.

Such persons include the proprietor, local governments, local and regional planning bodies, local environmental groups, and state environmental and aviation agencies; but do not include national interests such as airlines, aircraft manufacturers, pilots, or national environmental organizations. These national interest groups will have ample opportunity to voice their concerns on an equal basis on the national aspects of the aircraft/airport noise problem. The development of individual airport noise control plans is basically a local problem which should be skewed toward local inputs.

The plan development process should be designed to encourage all of these relevant parties to participate by making it in their self-interest to do so. A corollary of this is that no party should be capable of delaying or halting the process by delaying or refusing to fulfill its responsibilities; since the interests of any one party might in some situations call for it to delay or halt the process if it could do so. The process should, therefore, be capable of proceeding without the input of any given party. In the key steps of development of airport implementation plans, this should itself be an adequate sanction to assure that each party will fulfill its role, since if it does not, it will feel the effects of an implementation plan which does not reflect its input. Mechanisms should be provided to assure, to the maximum extent possible, that each party will understand what its responsibilities are and that it is within its ability and best interests to fulfill them.

(iii) A specified form in which the FAA will receive and consider proposed airport noise control plans for approval or disapproval, and the basis for that consideration. As discussed above, the existing legal authority as well as the necessity that individual airport noise control plans be consistent with the national aviation system make it essential that the FAA make the final determination as to whether each proposed airport plan is acceptable. Proposed plans could be received and considered in at least two ways which would be consistent with the need for local development of plans:

FAA could require airport proprietors to submit a single proposed plan for approval or disapproval accompanied by evidence that the airport proprietor has sought the cooperation of the other affected local parties and considered their input in the development of the proposed plan. This would put the airport proprietor at the center of the plan development process, and limit the FAA to the role of reviewer. The real effectiveness of the inputs of local parties other than the airport would be dependent to some extent on the good faith of the proprietor in considering them.

Alternatively, FAA could receive proposed plans directly from all of the relevant local parties who care to submit them, as well as the airport proprietor, and make its own initial decision as to the best proposed plan or combination of proposed plans. This would put the local parties on more of an equal footing in the decision-making process.

Either of these decision-making forms would allow the FAA to insure that individual airport noise control plans are consistent with the national airport system. Either form would also allow it to determine that plans met minimum standards for protection of public health and welfare, monitoring for enforcement purposes, and the like, which could be established as part of the airport noise regulation.

The latter form, however, would put the FAA much more in the position of determining as well what is the "best" plan for particular airports. This might be less desirable from the viewpoint of the theory of decision-making discussed above; but it would make the final plan more definitively a a national plan.

(iv) A specified set of sanctions, based upon existing FAA powers, for violation of various parts of approved airport noise control plans. The problems of enforcement of an accepted plan are separable from the problem of establishing an equitable mechanism for developing plans. The available means for enforcement of airport noise control plans are discussed in Section III(E) of this report.

Finally, consistent with its established control of all airport tower operations and the fact that accepted airport noise control plans will be FAA regulations, the FAA should probably be responsible for monitoring for enforcement of accepted plans.

(2) Role of the Airport Proprietor

As indicated above, the role of the airport proprietor would vary slightly depending upon the nature of the approval mechanism established for airport noise control plans. It will be either the central figure in the development of the plan, or an advocate of one proposed plan on a theoretically equal basis with other local parties advocating other proposed plans, or perhaps other roles derived from some other type of plan development powers.

In any of these roles, however, the airport proprietor must be the key party to provide the data regarding present and projected future airport operations which is necessary for use in the development of a noise control plan. The airport noise regulation should, therefore, require airport proprietors to develop data and supply it to all of the other parties involved and to the FAA.

The airport proprietor might be the central figure in many of the possible financing mechanisms for the airport noise regulation (such as Federally levied passenger head taxes or noise-related landing fees) which pass the economic burden on to the consumer of air services. If it were determined that the FAA could not or should not undertake the monitoring function for enforcement of accepted plans, that role, or some portion of it, might fall to airport proprietors under FAA supervision.

(3) Role of Local Governments

The role of local governments would also vary slightly depending upon the form of the mechanism for adoption of proposed plans, from giving input to the airport proprietor to possibly developing complete proposed plans of their own. In any role, however, local governments must serve as the prime representatives of the people impacted by the airport. Local political forces can be expected to generate a more or less definable position for each community impacted by the airport, which will be based to some degree on both the environmental and economic impacts of the airport on the community. That position will then characterize the position taken by that local government in the airport plan development process.

Since local governments are the only parties with real authority

to control land use (in ways other than acquisition of property rights) the decision upon and enforcement of those aspects of the airport plan dealing with land use control must depend largely upon their "enlightened self-interest." Participation in the airport plan development process should give them every opportunity to perceive that self-interest, however. And they will have every incentive to participate, since by doing so, they can influence the shape of the final airport operating plan adopted by the FAA. The extent of their influence can be expected to depend to a large degree upon the extent of their good faith participating in the plan development process.

Failure of any affected local governments to participate should not be allowed to delay or stop the plan development. The other parties should proceed as best they can on the other aspects of the plan, especially those involving airport operations, which are within their power. At the same time, they should make it clear to the people in any non-participating jurisdiction that their government is not representing their interests. Political blame for shortcomings in the airport operating plan affecting whole communities, which could be avoided by such representation, should then fall where it belongs. (Since the final adopted plan will represent an FAA decision regarding a part of the national aviation system, individual claims regarding legal rights affected by that decision should be directed at the FAA.)

Furthermore, the failure of some local governments to participate does not preclude inclusion of decisions regarding proper land use in the final plan, although it would, of course, greatly hamper the enforcement of those decisions. The FAA could still decide that particular types of development should not be allowed in particular areas; and those decisions could be "enforced" to some degree by the economic sanctions within the power of the Federal government. The fact that such enforcement would be far from complete would not negate the value of such decisions, since they would still serve as a deterrent to incompatible development and as a stimulus to future local officials to enact proper land use controls for such area.

(4) Role of Local and Regional Planning Authorities

The relevant planning authorities are in the best position to develop and supply to all the other parties, the data regarding present and projected future land use which is necessary for development of airport plans. Their initial role should, therefore, be to develop and supply such data. Once again, there should be alternative means (such as census data) to obtain such information and proceed with development of the plan if planning authorities cannot or will not cooperate.

Planning authorities can be expected to serve as somewhat of an objective check on the other local parties, since they are relatively

isolated from the politics affecting land use and the economics of airport operations. The plan development process should, therefore, be designed so as to enable the final decision-maker (the FAA) to isolate the views of cooperating local planning authorities from the views of the airport proprietor and/or the local land use control authority. This could take the form of an appraisal of land use by the planning authorities to be submitted separately from the proposed airport plans (whether proposed plans are submitted only by airport proprietors or by both proprietors and local governments).

(5) Role of State Governments

State governments are likewise relatively isolated from local pressures and therefore are in a position to serve as a check on them. They can participate in the process either by advising the local parties and the FAA on the merits of proposed plans, or by preparing and submitting to the FAA separate proposed plans of their own. The latter role should put them in a more authoritative position to mediate between the local parties, since both airport proprietors and local governments would want the support of the State behind their position when the FAA is faced with differing positions to choose between.

Several separate agencies are relevant: the state aviation agency and the state environmental protection and/or land use (when and if the latter are created) agencies. These agencies can be expected to represent, on a hopefully somewhat more detached and objective level, the interests which are more directly represented by individual airport proprietors and local governments. Airport noise control plans worked out between them could, therefore, serve as a test of the merits of plans worked out at the local level, to help the FAA in its decisions upon final plans.

(6) Role of the Environmental Protection Agency

EPA should continue to develop and evaluate tools which can be used to determine the effects (environmental, social, and economic) of various possible airport noise abatement options, and to advise the parties responsible for developing airport noise control plans in the use of such tools. EPA can thus help the other parties understand what decisions they will have to make and what the consequences of those decisions are likely to be.

Further, since each FAA approval of a local plan will constitute a major Federal action affecting the environment, an environmental impact statement will be required, on which EPA must comment. This places EPA, in a sense, in the Federal review process for local plans.

E. Enforcement of Adopted Plans

As discussed above, adoption of airport noise control plans by the FAA will greatly advance resolution of the problem regardless of the degree to which those plans can be enforced. Some aspects of those plans will clearly be enforcible to a greater degree than others. However, under existing statutes, the following powers are available to the Federal Government and are being used by it to enforce responsibilities analogous to those which would be imposed by an airport regulation.

(1) FAA: The FAA is the key legal authority in the entire airport regulatory process, since it and it alone has the authority under Title VI of the Federal Aviation Act of 1958, as amended, to certificate airports for noise. A number of powers are available to the FAA to enforce its regulations.

a. Section 609 of the Federal Aviation Act of 1958, as amended, (49 U.S.C. 1429) provides that the Administrator may from time to time reinspect any civil aircraft, engine, propeller, appliance, air navigation facility or air agency, or may reexamine, or if, as a result of any such reinspection or reexamination, or if, as a result of any other investigation made by the Administrator, he determines that safety in air commerce or air transportation and the public interest requires, may issue an order amending, modifying, suspending, or revoking in whole, or in part, any type certificate, production certificate, airworthiness certificate, airman certificate, air carrier operating certificate, air navigation facility certificate, or air agency certificate.

This power is commonly used against airmen for serious or continued violations of flight safety procedures. In a few cases its use has been threatened to obtain compliance with FAR 139, which requires operating certificates based on safety equipment and procedures for all airports serving C.A.B. certified air carriers; but in the one year that FAR 139 certificates have been in effect it has not been necessary to actually invoke it against an airport to obtain compliance. 2/

b. Section 901 of the Federal Aviation Act (49 U.S.C. §1471, elaborated in FAR § 13.15) provides for the imposition of civil penalties, not to exceed $1,000, for each violation of Titles III, V, VI, or or XII of the Act and regulations issued thereunder. Each day of a continuing violation constitutes a separate offense. Such penalties are expressly made subject to compromise by the FAA General Counsel, Associate General Counsel for Operations and Evaluations, Aeronautical Center Counsel, or Regional Counsel. Aircraft involved in

violations are subject to seizure and lien for the penalty. Fines of $1,000 per day have been imposed on airports on six occasions to obtain compliance with the FAR 139 certification program. 3/

c. Section 902 of the Act (49 U.S.C. § 1472) provides criminal penalties for certain willful acts, including forgery or "false" making of certificates and willful failure to make or keep required reports or records.

d. Sections 313 and 1004 of the Act empower the FAA Administrator to perform such acts and conduct such investigation as he determines necessary to carry out the provisions of the Act, including authority to hold public hearings, take evidence, issue subpoenas, and take depositions.

e. Section 1007 of the Act (49 U.S.C. § 1487) authorizes the FAA Administrator or the Civil Aeronautics Board or their agents to apply to United States District Courts to enforce by injunction provisions of Chapter 20 of the Act (which includes Title VI) and any rule, regulation, requirement, or order under it, or any term, condition, or limitation of any certificate or permit issued under it.

f. Section 1005(a) of the Act, (49 U.S.C. § 13.20) authorizes the FAA Administrator himself to issue cease and desist orders whenever he is of the opinion that an emergency requiring immediate action exists in respect of safety in air commerce.

g. Section 1101 of the Act (49 U.S.C. § 1501), requires public notification of the construction or alteration, or the proposed construction or alteration, of any structure where notice will promote safety in air commerce. Although there is no authority to forbid such construction or alteration, FAR Part 77 establishes an elaborate procedure for determination of whether a hazard will exist and for notification of all interested parties - including particularly any local jurisdictions or government agencies which might have authority to prevent the construction or alteration if the determination is positive. In addition, the Secretary of Transportation may deny further AADA projects at an airport unless he receives satisfactory assurances, in writing, that "the aerial approaches to the airport will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards" [49 U.S.C. 1718(3)]. This power has been used to put pressure on airport proprietors to negotiate with their neighboring property owners regarding hazards.

This procedure has in most cases been sufficient to prevent construction or alterations which would constitute hazards. In some cases where the hazard is not prevented or removed, it is modified

to include elaborate warning devices to mitigate the danger. Occasionally, however, it has been necessary to modify flight procedures (such as minimum visibility requirements) at particular airports to compensate for hazards which could not be prevented. 4/

h. The Airport and Airway Development Act of 1970 (49 U.S.C. § 1711 et seq.) calls for the formulation of a National Airport System Plan and for Federal grants for airport projects consistent with the plan. As noted above, the "carrot" of AADA funds has been used by FAA to bring about the removal or prevention of hazards to aviation. The same "carrot" is available to encourage appropriate land use controls with regard to noise. Under Section 18(4) of the AADA, 49 U.S.C. 1718(4), the Secretary of Transportation may condition approval of AADA projects on the receipt of assurances in writing, satisfactory to him, that "appropriate action, including the adoption of zoning laws, has been or will be taken, to the extent reasonable, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft."

In addition, all AADA projects must "provide for the protection and enhancement of the natural resources and the quality of environment of the nation," take "all possible steps to minimize" environmental damage, be "in accordance with standards established by the Secretary, including standards for site selection and airport layout" and be "reasonably consistent with plans (existing at the time of approval of the project) of planning agencies for the development of the area in which the airport is located...."

i. Finally, the FAA routinely brings about compliance with its regulations, including particularly FAR 139, through administrative sanctions such as "letters of correction" and "warning notices." Such communication backed up by the ability to impose legal sanctions, are usually sufficient to correct violations. See FAA Order 5200.3, "Airport Certification Program Compliance and Enforcement."

(2) HUD: The Department of Housing and Urban Development has authority to condition its grants and loans in whatever (constitutional) ways it finds necessary to bring about "safe, decent, and sanitary housing." Pursuant to their authority, it has already established noise guidelines for its housing grants. It should be willing to add to its noise guidelines a requirement that proposed projects be compatible with relevant airport implementation plans.

(3) VA: The Veterans Administration is in the process of adopting the HUD noise guidelines, or an equivalent of them, and should likewise be willing to include as a guideline compatibility with airport plans.

(4) EPA: EPA has some authority over land use under the Clean Air and Water Acts. The possibilities for utilizing this power to further compatible land use around airports are being investigated. (Especially see "EPA Authority Affecting Land Use," by F. P. Bosselman, D. A. Feurer and D. L. Callies, March 12, 1974.)

(5) DOT: The location of transportation facilities is a prime factor in the pattern of development of land. The possibilities for using conditions in DOT grants to further compliance with airport plans are being investigated.

(6) FDIC: Banks insured by the Federal Deposit Insurance Corporation (FDIC), and all banks which deal with such banks, are now prohibited from financing development in flood plains. A similar provision with regard to airport noise impact zones would be very effective in preventing incompatible development. It would probably, however, require new legislation.

IV. The Role of an Airport Noise Regulation in the Total Program and a Statement of the Process Envisioned

A. The Problem and Approach

Throughout the history of the aircraft noise dilemma, it has been extremely difficult to determine the accountability and responsibility of the parties involved. This is particularly applicable in the local milieu -- where airport proprietors, local governing bodies and regional planning agencies have been attempting to ameliorate the conflict between airports and adjoining land uses. Solutions have been elusive because of the unforseen consequences resulting from the introduction of jet aircraft into the air carrier fleet and the competition between political jurisdictions for scarce resources within economic trade areas.

The noise levels emitted by aircraft utilizing a facility are not within the proprietor's control and, further, substantial uncertainties exist concerning the legality of operational abatement strategies which may burden interstate commerce or infringe on a regulatory area preempted by the Federal Government. Nevertheless, the proprietor has been held responsible for aircraft noise.

In attempting to identify an appropriate role for an airport noise regulation and design a workable process, it has been necessary to emphasize the local decision making process and the relationships between local institutions forced into an adversary situation. The local milieu has been viewed as being affected by three broad variables; (1) The noise emissions resulting from the operation of the airport, (2) The extent of existing and potential incompatible encroachment near flight paths, and (3) The degree of political fragmentation present in the airport impact zone.

The measurement of aircraft noise, the prediction of its effects, and the forecasting of future emissions based on a wide variety of variables is a highly developed and sophisticated science. The lack of a universally accepted methodology and type of format employed in presenting the level and extent of emissions are two remaining but readily soluble problems.

Measuring and predicting the extent of encroachment has raised more serious problems. In the past, analysts have attempted to classify land development as being either preventative or remedial and as being basically compatible or incompatible with specified levels of aircraft noise. The extent of encroachment is more clearly dependent upon the degree of compatibility of existing and projected land use, and the level of land use control and commitment to development affecting undeveloped land. Both compatibility and preventiveness must be viewed as continuums if accurate estimates of encroachment and impact are to be obtained.

The degree of political fragmentation is extremely important in identifying the role of an airport noise regulation. Where the impacted jurisdiction and the airport proprietor are the same governmental entity, the certification of the airport may require very specific land use analyses and abatement strategies; where the impacted jursidiction is not affiliated with the proprietor, sanctions available in the certification process are clearly not applicable. In such situations, it is important that the certification process itself create significant incentives capable of eliciting local cooperation and compliance. However, it is imperative that such cooperation and compliance consist of local decisions and commitments which force the problem of unacceptable noise exposure resulting from inadequate land use planning and control into the local political arena. Local land use decision makers should face the consequences resulting from a commitment to development in areas known to be adversely affected by aircraft noise -- not through Federal sanctions but through the local political process.

B. The Role of An Airport Regulation

The proposed airport regulation should:

* Establish a uniform process for airport impact evaluation.

* Provide a mechanism for the amelioration of conflict at the local level.

* Establish reasonable classification criteria for both aircraft and airports which may be effectively utilized in equitably distributing abatement costs among users.

The first objective, the Establishment of a Uniform Process for Airport Impact Evaluation, could be accomplished by prescribing the following sequence of events:

(1) The Encroachment Classification of Airports. A designated agency of the Federal Government would assume primary responsibility for classifying airports as to the degree of encroachment of incompatible development upon major flight paths, the types of aircraft utilizing the facility, and the number of annual operations. Proprietors would be notified of the classification of their airports and provided information and assistance requisite for an appeal of the classification. Final classification would determine which sections of the regulations were applicable and whether compliance was mandatory, discretionary or exempted.

(2) Required Application of the Noise Units Methodology. Classifications indicating a substantial degree of encroachment would require the application of a prescribed methodology for determining the extent of the noise exposure problem. The extent would be measured in Noise Units closely approximating person hours of exposure. Proprietors would only be required to develop the emissions component of the methodology, which would include the generation of noise exposure values for

parcels described by a geographic grid, with a higher degree of resolution (smaller sampling areas) specified as a function of proximity to flight paths and the airport's runways. Proprietors would also be required to distribute a standard notice to all local planning agencies, local governing bodies, and in particular, to the regional planning agency with the most comprehensive interjurisdictional authority to plan.

The development of the "sensitivity" component of the methodology would require the generation of noise sensitivity ratings for the parcels delineated by the geographic grid. Notification would also include an offer of monetary assistance (financial assistance for the planning effort, though flowing through the proprietor, should originate at the Federal level as planning grant money), and indicate that while compliance was clearly discretionary, failure to provide the necessary information "in a timely and expeditious manner" could result in the noise certification of the airport without their input. The procedure for developing both the emissions component and the sensitivity component would be described in a noise units manual, provided by the Federal government. Localities would have the option of applying the methodology themselves or assigning the responsibility to the regional planning authority with the most comprehensive interjurisdictional authority.

A critical part of the sensitivity component would include the classification of undeveloped land and determination of "potential noise units" existing therein, as a function of the level of public and private commitment to development (status in the local comprehensive plan, whether and how recently it has been subdivided, what agreements have been made with a developer, and the status of the supporting community facilities --especially water, sewers, roadways and utitilities) and the level of public control exercised over the property (zoning, housing and building codes, official mapping, subdivision regulations, easements, leasebacks, sellbacks with covenants, fee simple title, taxation, etc.)

Combining the emission and sensitivity components would then yield both actual and potential noise units and depict their spatial distribution at a meaningful level of geographic resolution. The total noise units resulting from a "Base Case" operational configuration would constitute a critical criterion for classifying and regulating the airport. The local disposition of potential noise units could be used as one criterion in determining whether a given airport qualified for exceptions, variances, conditional uses, or temporary certification.

(3) Identification and Implementation of Insignificant Cost Options

From the Noise Units Methodology, it may be determined that certain abatement options, having little or no measurable cost, can improve the noise climate in the vicinity of the airport. This would include certain operational strategies, such as changes in flight paths and runway utilization, and in some cases, changes in land use control. Again, local cooperation would be encouraged by the fact that attitudes

toward potential noise units would predispose the certificating agency to grant exceptions and variances to the proprietor. Of course, any jurisdiction directly affiliated with the proprietor would be excluded because of the possibility of collusion -- in such instances changes in land use control and reduction of potential noise units would be requisite for certification, as would the reduction of actual noise units achieved through other mechanisms.

(4) The Determination and Required Implementation of Cost Effective Abatement Options

It is likely that the most effective abatement options will incur considerable costs. Night curfews, selected use of quiet aircraft, changes in runway alignment and the acquisition of avigational or use easements (to prevent incompatible new development) are but a few of very costly but effective abatement options available to the proprietor. It is equally important to recognize that changes in land use control, even when accomplished through low cost applications of the local public power, may result in substantial costs in terms of displaced economic activity and adequate housing. Such costs, together with the more direct costs resulting from forms of control requiring compensation and capital investment, must be determined for a wide variety of abatement options. Once such determinations have been made, the most cost effective strategies should receive priority and adequate funding be made available.

This final set of strategies, including phasing, financing, relocation, and participation elements would constitute the airport noise abatement plan. An airport would be certified where the plan could reasonably be expected (the test here being the actual levels of comitment made by participating parties) to reduce noise units by an acceptable amount within a specified time period and/or prevent the addition of new noise units arising from new development. Where the proprietor failed to meet his obligations set forth in the plan, the most appropriate and effective remedy would probably be a fine imposed by the certificating agency. Adverse changes in local land use policy would result in an appropriate increase of the number of noise units permitted for that time period, i.e., the increase in potential noise units could be deducted from the proprietor's quota. In any case, the realization of actual noise units from potential noise units resulting from incompatible development would not be the responsibility of the proprietor, unless he were directly affliated with the affected jurisdiction.

The second objective, the provision of a mechanism for the amelioration of conflict at the local level, would be met by the successful application of the above impact evaluation process.

The described process attempts to force local adversaries with competing needs and priorities to cooperate and arbitrate. On the one hand, proprietors have the capability and responsibility to reduce aircraft noise impact to the fullest extent that is technologically feasible

and economically practicable. On the other hand, local land use decision makers have the authority and responsibility to prevent incompatible development from encroaching upon airports and for implementing cost effective abatement options in the interest of protecting the public health and welfare.

Probably the agency or agencies responsible for administering the airport noise regulation should deal directly only with proprietors. Proprietors, in turn, would be directed to solicit cooperation and compliance from local land use decision makers through a process of notification which must be carefully worded and presented so as to avoid giving the impression that either the proprietor or the Federal government is attempting to make local land use decisions, or that the Federal government is attempting to elicit compliance by using the threat of continued noise exposure as a sanction. The impression that notification should impart is that the local land use decision maker is being afforded both the opportunity and the financial resources to submit evidence that will result in reduced noise exposure in his community.

However, certain actions (or lack thereof) are likely to be interpreted by the administering Federal agency as indicating that the local decision makers have considered the matter and determined that aircraft noise is a less important consideration than other factors. The local decision makers would realize that the prescribed public hearings required of the proprietor (also mentioned in the notification) would be likely to make a highly noise sensitive segment of their constituency aware that they are in a position to assist both the proprietor and the Federal government in the reduction of aircraft noise in their community. Thus, an existing political institution may be utilized in the arbitration process in a manner permitting considerable local discretion while placing an equitable portion of the burden of protection of the public health and welfare upon the elected local governments of the people whose health and welfare is being protected.

Notification of local land use decision makers should also distinguish between those steps in the process requiring cooperation in providing basic planning data (i.e., the sensitivity component) from those involving some local commitment to a land use control strategy. Planning data can be provided by a regional (and more impartial) agency in a more consistent and efficient manner. Land use controls must be left to local communities. The application of the noise units methodology has been deliberately designed to require only planning data, and hence, only the cooperation of a regional planning agency is necessary. This insures that an important step in the process will be completed even in the absence of local cooperation. However, it would be advisable to give local land use decision makers the option of conducting the noise sensitivity component themselves because the delegation of that responsibility to a regional planning agency would essentially constitute a local commitment to the process itself and would render the local decision maker more accountable for its findings.

Specific land use control strategies would actually be a required component of the airport proprietor's plan; it would not be necessary for the proprietor to have the power to implement all of the elements of his plan. In fact, in many situations, this would be highly undesirable -- certainly a broad interpretation of the "public welfare" would include the right to influence local land use decisions through one's elected officials. However, where the land use control component of the proprietor's plan cannot be implemented through a carefully documented process of negotiation, certain variances and exceptions would be in order, presumably because local decision makers and their constituents do not consider the existing or projected noise exposure to be important. It would clearly be a waste of resources to implement expensive abatement strategies to protect a segment of the population that does not treat the reduction of noise exposure as a priority consideration. Even where there is a complete lack of cooperation at the local level, the affected land use decision makers would inherit the responsibility for permitting future incompatible development in areas experiencing high levels of aircraft noise exposure.

The third objective, the establishment of reasonable classification criteria for both aircraft and airports which may be utilized in equitably distributing abatement costs among users, is accomplished by the application of the airport encroachment classification system and the noise units methodology together with a regulation which would classify aircraft according to their established noise emission characteristics and assign an appropriate base rate of taxation for their use. Because more research is necessary to establish the cost of a comprehensive noise abatement strategy, the suggested procedure below should be considered as a general example of a proposed process.

All aircraft meeting FAR Part 36 could be exempted from user charges to be imposed by the CAB. All other aircraft might be assigned a base rate of taxation which would be involved only when they are operated from airports with a specified minimum classification. The most equitable type of user charge would probably be reflected in an increased ticket price paid by the passenger and correspondingly increased shipment charges for freight.

The encroachment classification assigned to all airports would be used for tax purposes only for those facilities which achieve a "discretionary" status, where the more extensive noise units methodology is not mandatory. In such cases, passengers would pay only the base rate assigned to the aircraft they selected. For example, an aircraft meeting FAR Part 36, such as a DC-10, would not be taxed. However, if the base rate assigned a Boeing 707 were $5.00, this user charge would be added to the ticket price.

The airport classification developed from the noise units methodology would result in the imposition of a separate and additional user charge on all aircraft, keyed to the actual noise exposure resulting from its operation from a given airport. A DC-10, which would not

have a base aircraft tax, would be taxed if it operated from an airport with a very high noise exposure rating, and the user charge would be approximately factored.

In summary, the system of charges envisioned is one which differentiates between aircraft types by their noise characteristics, and also scales upward or downward at specific airports according to the degree of noise impact extant there.

Under existing law, it is likely that the CAB has the authority to authorize such a user tariff, although it is not likely that the resulting funds could be disbursed for noise abatement purposes. New legislation, (or amendment of the Airport and Airway Development Act) authorizing the use of such funds for noise abatement strategies, including local land use options, would be necessary.

Such a system would have an enormous potential for generating revenue. For example, an average user charge at Chicago O'Hare could generate over $350 million in revenue annually. The great disparity in revenue generation potential is likely to require new legislation authorizing the use of such funds at the local level. The availability of such funding would create a strong incentive for cooperation, supplementing those previously mentioned in the certification process.

C. The Process Envisioned

This section will be a detailed explanation of the step-by-step process envisioned, related timing and phasing elements, and required supporting documents. This analysis and presentation could be shown as an organization matrix, with the stages in the process listed in the left column and the following variables across the top row as column headings:

1. Controlling decision maker(s)
2. Affected decision maker(s)
3. Required commitment
4. Means of eliciting compliance
5. Mechanism demonstrating compliance
6. Public participation and notification requirements
7. Supporting documents
8. Constraints and limitations
9. Solutions and alternatives
10. Research and analysis requirements

The stages analyzed for each of these variables are:

1. Advance notification
2. Selected information request
3. Preliminary deletion of facilities from consideration
4. Federal encroachment classification
5. Notification of encroachment classification
6. Appeal and disposition of discretionary cases
7. Required application of the "short form" noise units methodology
8. Required application of the "long form" noise units methodology
9. Noise units classification of airports
10. Required submission of Phase I (Draft) Plan
11. Required public hearings (held by proprietor)
12. Implementation of insignificant cost options
13. Determination of variance, exception or conditional use based on local disposition
14. Determination of cost effectiveness of options
15. Required submission of Phase II (Final) Plan
16. Required implementation of cost effective abatement options

Based on the identification of subtasks, attempts will be made to estimate the timing of this sequence of events. A flow chart will clarify the relationship between stages and subtasks, while the completed matrix will be useful in identifying key actors, documents and requisite processes.

The following necessary documents are being developed at EPA, as part of the airport regulation program:

- Airport Encroachment Classification Manual
- Noise Units Methodology Handbook
- Standard Notification Forms

. Federal/ Proprietor

. Proprietor/ Local Land Use Decison Makers

Initial indications of the forms of some of these documents are provided in Appendix C.

D. Technical Assistance from the Federal Government to Proprietors, and State and Local Governments

The Federal government has the capability of providing technical assistance to the states and localities in preparing their plans. This assistance may be in the form of:

. Permitting access to computerized models and data banks for prediction of community noise from airports, highways and other major sources.

. Permitting access to general noise information literature retrieval systems

. Lending of noise monitoring equipment

. Conducting training courses and conferences for public officials, community financial leaders and the general public

. Providing direct consultation on technical and legal problems

. Provision of model state and urban noise control legislation

. Provision of miscellaneous information (films, manuals, etc.)

These are the kinds of assistance which presently are being given by EPA and several other agencies, and are expected to continue and increase. It is anticipated that the EPA regional offices will be the central coordination points for persons requesting such assistance.

E. Relation to ongoing state/local land use planning/control and to Federal decisions affecting the airport and surrounding communities.

Historically, land use zoning has been primarily a local function and to a limited extent some states recently have been imposing restrictions on land use. Several Federal land use bills have been considered but as of yet none has been enacted. However, several Federal agencies (primarily EPA, DOT, and HUD) have some indirect influence over land use. These influences fall into three categories:

1. Indirect control through their discretion over Federal grant money to states or cities.

2. Control over Federal money which goes to individuals.

3. Specific authority to approve or disapprove certain state programs; e.g., waste water treatment plans.

One of the goals is to determine how states might be encouraged to develop their own airport land use plans or require local development of such plans by placing restrictions on the granting and use of Federal monies. Two problems arise:

1. There is a continuing shift of Federal intergovernmental monies from grant programs to the general revenue sharing program, resulting in the loss of Federal restriction on the receipt and use of the money.

2. If states are encouraged to develop land use plans (or at least policy) which coordinate with Federal goals, the plan still has to be imposed on local governments, a step which is difficult at best. This may be avoidable by state enactment of requirements that local governments develop such plans.

Such efforts are confined to the interest and authority of the particular agency or office and thus lack the pervasive and long range aspects which are necessary for any efficient land use plan. For example, if air quality is poor, regulations may be promulgated by EPA under the Clean Air Act to control further increases in air pollution, but the air standards may be met by increasing water pollution or some other detrimental activity. HUD refuses to guarantee loans for housing in noise impacted areas but at present the VA will. DOT has the authority to refuse to finance roads that will induce new housing in noise impacted areas, but the state road authority can merely do some budget

reallocation to make sure the state requests money for non-noise area construction, and earmarks state funds for projects around airport or other noise impacted areas.

Piecemeal plans such as those mentioned above either (1) impact on a limited population, or (2) prevent only limited uses and thus although they may prevent the specific acts they are designed to prevent, they also create loopholes in the regulations, and place added burdens on States and localities. The loopholes result from different definitions and regulations applied by different agencies. The burden is that the states, localities, and individuals must interpret several varying regulations, which slows up their own regulations and also delays the imposition of Federal regulations and intent. Because of varied interpretations of conflicting rules from different agencies, and intentional hedging on the part of those individuals, localities, and states which do not want to comply, the conflicts have to be resolved through court action, legislation, negotiations, and adjusted regulations, all of which takes time. It would be worth considerable effort on the Federal government's part to develop an integrated process with respect to the various environmental requirements, so that local governments would not be confronted by a multitude of conflicting constraints the effects of which now become evident only at the point of land use decision-making.

The most desirable situation would be for each state to have in existence a comprehensive land use control program which would include control of noise impacted areas. However, to have a broad Federal land use program of some kind would lend continuity. The less desirable alternative is the piece-by-piece control by specific agencies over a limited number of activities. In this latter case it would be necessary for EPA, for example, to focus on airport noise and air quality impact and concentrate on those programs or grants which may be used to effect such control. The first major considerations in such an effort are:

1. Those controls which are likely to eliminate the most incompatible uses; and

2. Those controls which will have the most impact on future state or local activity or individual action.

Finally, rather than consider agency-by-agency regulatory action, legislation and/or the use of an Executive Order may be used to impose on agencies the duty to consider the land use impacts of their activities.

The President has authority to make use of the Executive Order to delegate to Federal agencies the responsibilities which are imposed upon him by Congress, or to direct agencies as to how the Executive Branch will go about meeting the policies and standards laid down by

Congress, including those in NEPA. An Executive Order lends continuity to Federal action and imposes a standing legal duty on agency heads to act in a given manner, thus narrowing the amount of interpretive discretion left to individual agencies.

The Environmental Protection Agency has the authority under the Noise Control Act of 1972 to recommend for promulgation by the Federal Aviation Administration airport/aircraft regulations to reduce the noise impact of aircraft on the public health and welfare. Existing technology and flight procedures can quiet aircraft only so much, therefore it is important to consider limitation on the development and use of areas which are impacted by aircraft noise.

The construction of airports creates developmental pressures. This includes residential housing and commercial/industrial expansion and results from:

1. High level of ground transportation accessibility generally available near airports;

2. Traffic volumes which attract:

   (a) Industrial/corporate offices because of high visibility

   (b) Commercial uses that service the automobile passenger;

3. Realization by entrepeneurs that business can most easily be conducted at the airport, motels, hotels, restaurants, etc.

4. Employees of air facility - as an employment center, demands are generated for housing, supporting services, etc., as general freeway congestion increases in a metropolitan area; and

5. Generally flat topography, which makes land development easy.

Control of these developmental pressures is a necessary part of airport noise regulations as well as other environmental regulation; e.g., air quality maintenance and sewage disposal. Efforts are under way to control the land use around airports to be built in the future. In most cases, however, the airport already exists and the ability to control development is the more important task.

The development of a proposed strategy for concerted Federal-state-local land use control, making efficient use of existing legal

authorities and institutions, is part of the current airport noise regulation program at EPA. It may well be the most challenging aspect of the entire study program. In the final version of the project report the resulting document will be presented as Appendix I. In this draft, Appendix I contains an outline of the planned study report.

V. Alternative Regulatory Proposals and Evaluation of Their Impacts

In the final project report, this section will display both the several alternative regulations postulated for evaluation and the results of those evaluations. The evaluation of alternatives will include all those facets which EPA would have to consider if the regulation were being promulgated by EPA. Hence, estimates of the nationwide effects must be developed which are responsive to the statutory decisional criteria incumbent upon both EPA and FAA in the regulation of noise from aviation.

The reason for this is two-fold: First, reasonable and prudent decisions by the EPA Administrator concerning the appropriate regulation to submit to the FAA require this complete data base. Second, the time table set forth in Section 611 of the Federal Aviation Act (as amended) for FAA response to EPA's submitted regulatory proposals implies the necessity for such a data base within 30 days of EPA's submittal, since FAA is required at that time to publish EPA's submitted regulation in a Notice of Proposed Rulemaking. Without the preparation and publication of such a data base in advance of EPA's submittal, the required FAA public hearings would be much less useful. More importantly, an extensive time delay between the FAA notice of proposed rulemaking and promulgation of a final rule could result, due to the necessity of carrying out the required studies to provide the missing data base.

Further, the FAA will be required to prepare an environmental impact statement on its proposed rule, which EIS will be subject to EPA review and comment. EPA's program for developing the regulatory package therefore must lay the factual groundwork for comment on the FAA's impact statement.

Therefore, the various regulatory alternatives must be evaluated in terms of:

* Amount of improvement to the public health and welfare with respect to noise, as a function of time (e.g., 1980, 1990, 2000).

* Maintenance of highest degree of safety. (Note that the final evaluation of safety rests with the FAA, and that regulations on aircraft noise emissions and flight procedures will have been evaluated individually with respect to safety).

* Probable social and economic impacts on airport regions (an approximate, national estimate).

* Probable economic impacts on the air transportation system, including foreign commerce and with various financing strategies acting on the economic system.

* Other major environmental (e.g., air quality) and resource (e.g., land and energy) effects.

Finally, there are certain pragmatic questions which must be answered prior to promulgation of a regulation, whether statutorily required or not. These include, in the case of an airport regulation, development of proposed methods for financing, the probable amounts of financial resources demanded both for administration and for implementation, and proposed implementation support strategies for such key issues as land use control and monitoring.

Study projects are under way to answer the above requirements. In some cases, significant portions of the information needed is being drawn from studies completed or under way in other agencies. The remaining body of studies is being done by EPA staff, with heavy support from contracted efforts.

There are two basic alternative paths which could be taken in an airport noise regulation proposal, and within each of these there are subsets. The two basic paths under consideration are:

(1) Specific performance standards with associated time tables for different categories of airports (classified according to the difficulty of achieving a specified standard). An example of this approach is the California airport noise standard.

The many different ways of expressing such a performance standard include, but are not limited to: (a) the amount of area of incompatible land, where "incompatibility" is defined for various land uses by a limiting value of noise exposure in a cumulative scale such as day-night average sound level (Ldn), (b) the number of people within specified limiting values of Ldn, (c) the number of Noise Units associated with a given airport and within its various emission intensity zones, where Noise Units are computed from a technique accounting for the presence of people, the relative noise-sensitivity of the activity associated with the land use, and the degree of noise exposure excess above a certain sensitivity threshhold.

(2) A specified process for local development and Federal approval of airport noise abatement plans, whereby the data requirements and public consultation requirements are so completely specified that a "best effort" result can be expected and yet maximum flexibility is available for the tradeoffs which must be made between "protection of the public health and welfare with respect to noise" on the one hand and conflicting general public welfare demands on the other.

The present disposition of the EPA airport noise regulation development team is toward the latter of these two basic alternative paths.

VI. The Recommended Regulatory Program

In the final project report, this section will contain the highlights of the particular regulatory program being recommended to the FAA. (An interim draft will utilize this section to provide the EPA staff's recommendation to the EPA Administrator, subject to his modification.)

The highlights of the regulation itself will be summarized (with the actual text relegated to an appendix). The highlights of the supplemental facets of the proposed program will also be summarized here. These supplemental facets include:

- Guidelines/processes/tools available for local development and Federal approval of airport noise abatement plans;
- Proposed strategy for administration, monitoring, and enforcement;
- Proposed strategy for financing;
- Proposed strategy for land use control consistent with approved airport noise abatement plans;
- Proposed Federal interagency cooperation strategy for supporting the implementation of the airport regulation;
- Legislative recommendations;
- Summary of anticipated impacts (positive and negative), based on the impact studies associated with the recommended regulatory alternative (to be reported in Section V above).

Detailed information in support of this summary will be provided in Section V or as appendices.

VII. Footnotes

Prologue

1/ "Report on Aircraft/Airport Noise", Report of the Administrator of the Environmental Protection Agency in Compliance with Public Law 92-574, Senate Committee on Public Works, Serial No. 93-8, August 1973.

2/ "Legal and Institutional Analysis of Aircraft and Airport Noise and Apportionment of Authority between Federal, State and Local Governments", Report of Task Group 1, EPA NTID 73.2, 27 July 1973.

3/ "Operations Analysis Including Monitoring, Enforcement, Safety and Cost", Report of Task Group 2, EPA NTID 73.3, 27 July 1973.

4/ "Impact Characterization of Noise Levels Including Implications of Identifying and Achieving Levels of Cumulative Noise Exposure", Report of Task Group 3, EPA NTID 73.4, 27 July 1973.

5/ "Noise Source Abatement Technology and Cost Analysis Including Retrofitting", Report of Task Group 4, EPA NTID 73.5, 27 July 1973.

6/ "Review and Analysis of Present and Planned FAA Noise Regulatory Actions and their Consequences Regarding Aircraft and Airport Operation", Report of Task Group 5, EPA NTID 73.6, 27 July 1973.

8/ "Public Health and Welfare Criteria for Noise", EPA Technical Document 550/9-73-002, 27 July 1973.

9/ "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", EPA Technical Document 550/9-74-004, March 1974.

10/ "Aircraft and Airport Noise Regulations", Notice of Public Comment Period, Federal Register Vol. 39, Page 6142, 19 February 1974.

Chapter I

1/ "Value of Aviation Activity", Fromm, G., Data Resources, Inc., January 1973.

2/ "The Long Range Needs of Aviation", Volume II, Technical Annex to the Report of the Aviation Advisory Commission, January 1973.

3/ Ibid.

4/ Ibid.

5/ "FAA Statistical Handbook of Civil Aviation", Department of Transportation Federal Aviation Administration (Annually).

6/ "Turbojet" powered also includes those aircraft engines which are commonly referred to as turbofans.

7/ Aerospace Industries Association.

8/ Federal Aviation Administration, Advisory Circular No. 150/5090-2, 25 June 1971.

9/ "Forecast of Air Traffic Demand and Activity Levels to the Year 2000", Semat, Hellosen and Eickner, Inc. 27 March 1972.

10/ "Impact Characterization of Noise Levels Including Implications of Identifying and Achieving Levels of Cumulative Noise Exposure", Report of Task Group 3, EPA NTID 73.4, 27 July 1973.

11/ Office of the City Attorney, Los Angeles, California.

12/ 49 U.S.C. §1301, et. seq., (used interchangably in this text as the 1958 Act).

13/ 49 U.S.C. §1349 & §1350.

14/ Airport and Airway Development Act, §51(b)(1), 49 U.S.C.A. §1432 et. seq., 84 Stat. 234.

15/ 49 U.S.C. §1348(a).

16/ 49 U.S.C. §1348(c).

17/ 42 U.S.C.A. §4901(a)(3).

18/ "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", EPA Technical Document 550/9-74-004, March 1974.

19/ 49 U.S.C.A. §1716(c)(3).

Chapter III

1/ City of Burbank v. Lockheed Air Terminal, Inc., 93 Sup. Ct. 1854 (1973).

Chapter III (con't)

2/ Conversation between Bass Lockett of FAA and Larry Blackwood of EPA, April 4, 1974.

3/ Ibid.

4/ Conversation between Charles Newpol of FAA and Larry Blackwood of EPA, April 5, 1974.

APPENDIX A

TEXT OF THE PROPOSED AIRPORT NOISE REGULATION

To be provided in future drafts of the project report, following the postulation of specific regulatory alternatives, and following their evaluation in terms of potential nation-wide benefits and consequences, to be set forth in Section V above.

APPENDIX B

RELATIONSHIP TO OTHER FEDERAL AVIATION REGULATIONS

This Appendix is expected to appear in the final draft of the project report. The intent is to identify significant changes in any other sections of the FAR's -- not necessarily those specifically related to noise -- which might be necessary for consistency with the proposed airport noise regulation.

APPENDIX C

GUIDELINES AND PROCESS FOR DEVELOPMENT OF AIRPORT IMPLEMENTATION PLANS

In the final project report, this Appendix will consist of the set of processes and procedural guidelines developed to assist airports and local governments in developing a preferred implementation plan or "airport noise abatement plan."

In the interim, an indication of the nature of these processes, guidelines and handbooks is provided in the preliminary text sections:

* A Proposed Airport Impact Evaluation Process
* Airport Encroachment Classification Manual
* Outline for the Handbook on Application of the Noise Units Methodology

It will be noted that a summary version of the "process" was given in Section IV C, above.

A PROPOSED AIRPORT IMPACT EVALUATION PROCESS

The following sequence of steps is intended to describe a process which airport proprietors and local planning agencies might employ in developing preferred Airport Noise Abatement plans. Such plans would be submitted to the FAA in order to obtain specific FAA certification for airport noise, in compliance with FAA Airport Noise Regulations. Each step in the process is intended to require increasing cooperation between proprietors and local planning agencies. Because it may not be possible to complete the entire process at airports experiencing intensive conflict with local jurisdictions, the successful completion of each step should provide a useful output that is not dependent upon further commitment or cooperation. The completion of the entire process is actually an idealistic goal; more effective plans are likely to result from the "ideal" methodology, but significant abatement potential should be realized if the process must be prematurely terminated for legal, political, or financial reasons.

Although Table 1 indicates that the Airport Impact Evaluation process is comprised of twelve sequential steps, there are only four significant outputs; (1) the Classification of Airports, (2) The determination of the resulting Noise Exposure (expressed in noise units) for various abatement options, (3) The development of a Short Range insignificant cost Airport Noise Abatement Plan, and (4) The development of a Long Range cost effective comprehensive Airport Noise Abatement Plan. These outputs are obtained as follows.

Table 1. Steps in the Proposed Airport Impact Evaluation Process

1. Proprietor's information request
2. Elimination and exemption of compatible facilities
3. Encroachment classification of airports
4. Notification of encroachment classification
5. Appeal of encroachment classification and disposition of discretionary cases
6. Required application of "Short Form" noise units methodology at selected facilities
7. Required application of "Long Form" noise units methodology at selected facilities
8. Noise units classification of selected airports
9. Required submission of short range plan for implementation of insignificant cost options
10. Analysis of trade-offs between program options available to proprietors and local agencies
11. Federal review of proposed long range abatement plan
12. Required implementation of cost effective abatement options

1. Proprietor's Information Request

Shortly following the promulation of the Airport Noise Regulation, the FAA would notify all airport proprietors of the purpose, intent, and requirements prescribed therein. Such notification would be accompanied by a questionnaire designed to obtain information concerning the operational characteristics and future intended use of air facilities (particularly general aviation airports in urbanized areas) for which data necessary for classification might be considered inadequate.

2. Elimination and Exemption of Compatible Facilities

Information received from such questionnaries and satellite photography would be utilized in determining which airports could be exempted from further analysis. Such exemption would probably be a type of temporary certification granted in cases where surrounding land uses and operational characteristics clearly indicate that a compatible relationship is present and will continue to exist for a substantial period of time.

3. Encroachment Classification of Airports

It is likely that a large number of airports will require more detailed evaluation in order to determine the appropriate level of effort and analysis techniques necessary to develop acceptable abatement plans. For this purpose, aerial photography and census data would be applied in a uniform way to all air facilities not previously exempted in order to determine the general extent of the encroachment of incompatible land uses on major flight paths. Such analytical techniques would result in numerical encroachment ratings, which would be modified for fleet mix and flight path utilization characteristics to obtain composite encroachment ratings. Such quantitative indices would then be employed in classifying airports as follows:

Class A - Severe encroachment; must comply with all sections of regulation; must employ both the short and the long forms of noise units methodology; entitled to special variances and exceptions in certification process.

Class B - Significant encroachment; must comply with selected sections of regulations; must employ the short form of noise units methodology and those sections of the long form pertaining to land use control for undeveloped land, must demonstrate hardship to obtain variance in certification process. Exceptions granted for severe political fragmentation.

Class C - Impending encroachment: must comply with selected sections of regulations; must employ the short form, stressing identification of potential noise units for undeveloped land. Variances granted only for severe hardship.

Class D - Compatible facility with extensive emission potential; must comply with selected sections of the regulation; must identify potential noise units for undeveloped land: abatement plan not required.

Class E - Compatible facility with insignificant emission potential; granted temporary certification.

4. Notification of Encroachment Classification

The classifying Federal agency would notify proprietors of the classifications assigned to their airports, provide the tools for an independent evaluation (Airport Encroachment Classification Manual) and a specified time period for appeal.

5. Appeal of Encroachment Classification and Disposition of Discretionary Cases

Proprietors conduct independent evaluation and appeal classification if there is a significant and detrimental discrepancy. Some proprietors may wish to obtain a higher classification and will be so classified upon written request. The classification of discretionary cases, (i.e., those falling between classes) would be determined on the basis of secondary considerations like the degree of local political fragmentation, track record in obtaining local cooperation in the land use decision making process, etc.

6. Required Application of the Short Form Noise Units Methodology

At this point, all airports not certificated during the classification process would be required to utilize the short form noise units methodology. The responsibility for applying this methodology would be divided between airport proprietors and local planning agencies, with the former developing a study area and geographic sampling system for the forecasting and presentation of noise emission levels and the latter utilizing the sampling system (using a grid, not contours) to develop and record the noise sensitivity of various land uses, including the potential sensitivity of undeveloping or redeveloping land. This portion of the noise units methodology is termed short form because the data requirements have been simplified in order to expedite the completion of a significant step in the planning process. For example, the proprietor would be making good estimates of emission levels for a limited number of options, while the local planning agencies would be developing noise sensitivity information from general land use and zoning maps.

Local cooperation would be elicited as follows. The airport proprietor would receive a document (or set of documents) from the FAA addressed to appropriate local governing bodies, inviting and encouraging their participation in the development of the Airport Noise Abatement Plan. Data requirements and requisite levels of commitment would be specified and financial assistance offered.

If the desired information were not developed and delivered in a timely and expeditious manner, the airport woudl qualify for automatic temporary certification because of a demonstrated hardship caused by the lack of local concern for the airport noise problem. If compliance had not been obtained by the end of the temporary certification time period, the proprietor would be authorized to engage a private consultant of his choosing to complete the local governments half of the noise units methodology. The exact procedures for applying the noise units methodology would be set forth in a noise units methodology handbook.

7. Required Application of the Long Form Noise Units Methodology at Selected Facilities

The Long Form would differ from the short form in that it would be required only for those airports experiencing a substantial and continuing aircraft noise impact, and would necessitate the development of a more extensive evaluation process. Noise emission characteristics for a wider variety of abatement options with more detailed operational variables would be required of the proprietor, while local planning agencies would need to include such factors as structural attenuation, transient population, and ambient noise levels in weighting the noise sensitivity of specific parcels of land. Acceptability criteria for noise exposure levels would be factored appropriately.

8. Noise Units Classification of Selected Facilities

The noise units resulting from both the short and long form analyses would constitute a final criterion for the classification of the more severely impacted airports. Such classifications could be utilized in determining funding priorities and developing financing mechanisms related to various user charges.

9. Required Submission of Short Range Plan for Implementation of Insignificant Cost Options

The completion of the noise units methodology should provide proprietors with detailed land use sensitivity information which could quantitatively and graphically depict the configuration of "Acoustical Space" in the vicinity of the airport, enabling them to

develop low cost abatement strategies related to operational options. In addition, the potential for increases in noise units resulting from land use changes (further encroachment resulting from the development or redevelopment of land) in specific geographic areas would be identified, clearly indicating the need for local cooperation and intervention or establishing priorities for the acquisition of property rights where necessary.

Such considerations would comprise important components of the short range plan, which would be presented at a public hearing and submitted to the FAA (and possibly other reviewing agencies) together with the comments and criticisms obtained. It is likely that much controversy would focus on what constituted an insignificant cost abatement option, for both proprietors and local land use decision-makers. The resulting exchange of information should result in an increased appreciation for the difficult situations facing both parties, and in some cases could hopefully lead to the pursuit of a few significant cost abatement options by both parties on a quid pro quo basis. Approval of the short range plan would result in temporary certification of the airport. Failure to develop an acceptable abatement plan would result in the proprietor operating his airport without certification, and requisite sanctions would be applicable, but only in cases where local planning agencies had fulfilled their obligations in a timely and expeditious manner.

10. Analysis of Trade-Offs Between Program Options Available to Proprietors and Local Agencies

Long term or continuing certification would be obtained by developing an acceptable long range, time phased, abatement plan that carefully analyzes a wide variety of program options associated with significant costs for both airport proprietors and local general purpose governments. Such a plan would stress the cost effectiveness of comprehensive abatement strategies comprised of various combinations of abatement options: flight schedule restrictions, land acquisition, restricted use easements, leasebacks, sellbacks, building codes, compatible use zoning, and restrictive growth policies related to the witholding of community facilities necessary for development.

Such considerations would result in the development of long range abatement plans that would achieve a reduction of a number of noise units by specified dates (e.g., at five, ten and fifteen year increments) that were technically, economically, and politically feasible.

11. Federal Review of Proposed Long Range Abatement Plan

The FAA and other state and Federal agencies (including EPA and HUD) would review the proposed long range abatement plan in order to determine funding priorities and the appropriate sanctions that

should be applied in order to elicit the requisite degree of local governmental compliance. An acceptable plan would then be adopted, a certificate granted, and monetary and administrative assistance provided.

12. Required Implementation of Cost Effective Abatement Options

Such support and certification would continue only in the presence of indications that the described abatement plan is actually being implemented. Provisions for exception and variances would be made in cases where unforseen circumstances prevent timely implementation. Decisional criteria for the granting of exceptions and variances should be set forth in the airport noise regulation itself.

AIRPORT ENCROACHMENT CLASSIFICATION MANUAL

(PRELIMINARY DRAFT)

A. PURPOSE

This manual has been issued in conjunction with FAR ___, by the Federal Aviation Administration, to assist airport operators in the determination of the general extent to which incompatible development exists in the vicinity of the airport and major flight paths; and is identical to the procedure employed by the FAA and participating agencies in determining whether more detailed analyses may be necessary. Facilities experiencing a substantial degree of encroachment will be required to apply the noise units methodology described in Part ____ of FAR ____. The noise units methodology is designed to assist airport operators and local planning agencies in evaluating the cost effectiveness of various noise abatement options, and to assist the Federal government in administering the airport certification process.

Because encroachment classifications are determined by participating Federal agencies, it is important that airport operators independently evaluate the land development in the vicinity of their facilities in order that they may be afforded the opportunity to appeal a given classification and more fully participate in the final disposition of discretionary cases.

B. DATA REQUIREMENTS, TOOLS AND SOURCES

It is important that the proper specificity of data be employed for the intended analytical purposes. Because the encroachment classification is general and descriptive in nature, only two basic sources of data are necessary: current aerial photography and the 1970 census of population and housing. There exists a potential trade-off between these two basic data sources. In highly urbanized areas, where land tends to be intensely developed and presented as a complicated mixture of building structures, aerial photography becomes difficult to use. Fortunately, where such conditions exist, census data is presented in the "block statistics" format, and may be used to validate conclusions drawn from aerial photography, or in some cases may be substituted for it. Conversely, in more sparsely populated areas, census data is presented in the tract or enumeration distract format and should be used only to estimate the occupancy ratios of dwelling units observed in aerial photography.

The list of data requirements, tools, and sources necessary to complete the encroachment classification of your facility is as follows:

1. Aerial photograph along all flight paths, terminating not less than 5 miles from the end of each runway.

The U. S. Coast and Geodetic Survey maintains such photography for all air carrier airports in the United States at scales of 1" = 1500' and 1" = 2500'. In addition the U. S. Geological Survey maintains aerial photography of the entire United States at a scale of 1" = 2000', although some sections are somewhat dated. A map of the United States, indicating the dates of the most recent photography, is available free of charge.

Many local planning agencies also maintain excellent aerial photography. Although scales of less than 1" = 1000' are common, requiring larger working spaces, they represent an important resource which should not be overlooked. Finally, many private aerial photography firms maintain a large inventory of current photography at various scales, and are equipped to respond quickly to specific requests.

2. The U. S. Census of Population and Housing for 1970. Enumeration district, tract, and block statistics are keyed to census maps at various scales. If your study area falls within an urbanized area, as defined by the Bureau of the Census, block statistics IIc(3), are available and keyed to census maps scaled to 1" = 2000'.

3. One logarithmically segmented, transparent template, appropriately scaled to the data source employed. Figure 1 presents the standard template at a scale of 1' = 2000'.

4. Current statistics on average annual daily runway utilization, and practical annual capacity for your airport.

5. Estimates of the current mix of aircraft utilizing your facility.

C. PROCEDURE

1. Obtain and assemble aerial photography and/or census data and maps as required.

2. Scale template in Figure 1 to match the scale of the data sources.

3. Using the attached worksheet, fill in the required data. The base of the template should be superimposed on the end of the runway and center on the flight path under consideration (see Figure 2).

4. Before beginning, examine the attached worksheet, Figure 1, and Table 1, to become familiar with the way in which the components of the procedure relate to each other.

Note that the segmented template is not a noise contour - it is a simple sampling device designed to record land use in incremental segments.

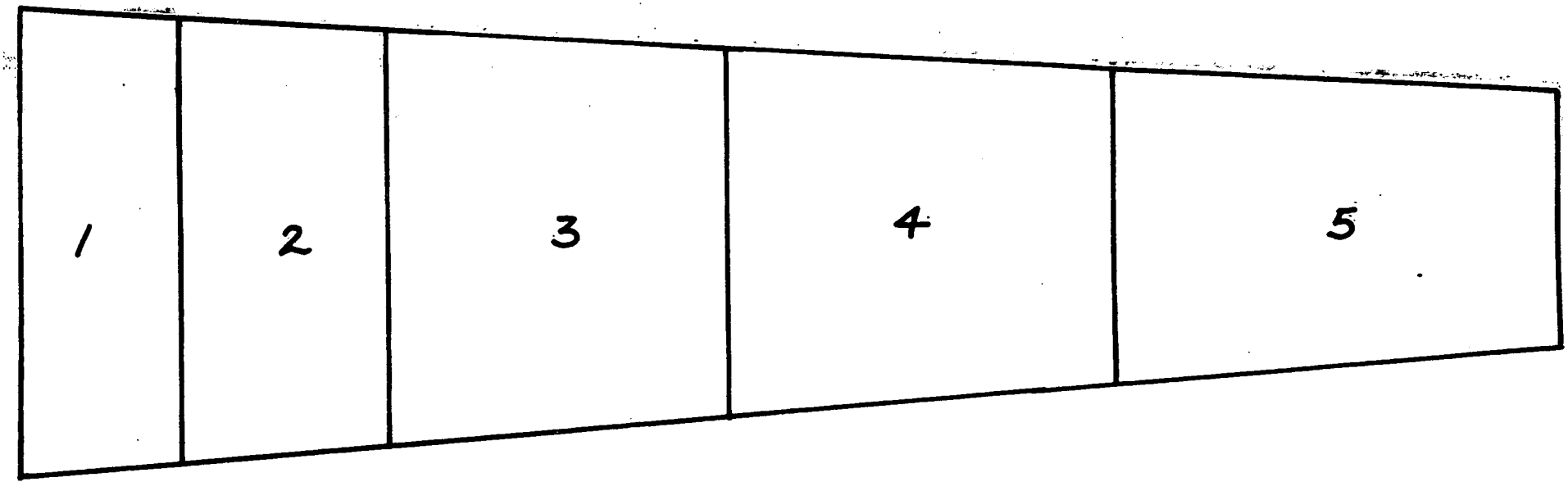

Figure 1. STANDARD TEMPLATE

The segments become progressively longer, because as the distance between the aircraft and the ground becomes greater, equivalent levels of noise are distributed over larger areas.

The entire template is blocked with a 10 acre grid to assist the analyst in estimating population density. It is important to note that the land use index (Column 1 on the worksheet) is derived from a density factor (Column E) and is not indicative of the population exposed to a given level of noise.

Note that there is one worksheet required for each flight path. The land use compatibility rating for your facility is the sum of all segment totals under Column 1.

5. The completed sample worksheet will clarify the procedure. It has been used to record airport operating and land use data for flight path 24R at a fictitious airport.

5.1 Column A identifies the segment of the template being examined.

5.2 In Column B, the analyst has made an estimate of the proportion of the segment which has been developed primarily for residential land use. It is often helpful to outline this area in grease pencil to assist in the derivation of dwelling unit density factors. Note in segment 4, the analyst's identification of an elementary school.

5.3 In Column C, the analyst has estimated the average number of dwelling units per gross acre in the developed section. Since much residential development is presented in fairly homogenous patterns in accordance with local zoning laws, it is rarely necessary to count every unit. The analyst will usually determine a dwelling unit density factor for a 10 acre parcel and apply it to all contigious development that appears homogenous. In more rural situations, where it is difficult to relate a parcel of land to a given dwelling unit, he must carefully examine the photograph to avoid counting the many outbuildings related to agricultural land use as dwelling units. In very urban situations, where a mixture of single and multifamily units is presented, census statistics should be used in determining density factors.

5.4 In Column D, the analyst has simply corrected for the average number of occupants per dwelling unit. Such ratios are usually derived from census data on housing and population for several tracts around the airport.

5.5 In Column E, the analyst has simply multiplied Column B times Column C times Column D.

5.6 In Column F, the analyst has determined the appropriate distance factor for each segment from Table 2, which adjusts the rate of decrease for the mix of aircraft using the airport as a function of the mean distance of each segment from the runway.

5.7 In Column G, the analyst has computed a noise exposure factor by multiplying Column F by Column E.

5.8 In Column H, the analyst has corrected for the average number of aircraft utilizing the flight path (takeoffs and landings). He has simply taken the average number of overflights, entered the log table (Table 2) and found that Log_{10} of 200 is 2.3.

5.9 In Column I, the analyst has derived the segment land use index by multiplying Column G by Column H and totalling the segments. Flight Path 24R therefore has a land use compatibility rating of about 197. The composite rating for the airport is obtained by totalling this rating for all flight paths.

TABLE 1 WORKSHEET FOR FLIGHT PATH 24R, U.S. INTERNATIONAL AIRPORT - SAMPLE

A	B	C	D	E	F	G	H	I
Template segment	Percent developed	Average dwellings per gross acre	Average occupancy ratio	Segment density factor (BxCxD)	Distance factor (from Table 1)	Noise exposure potential (ExF)	Log_{10} daily operations	Segment land use index
1	.20	4	3.6	2.88	10.0	28.8	2.3 (for 200)	66.24
2	.30	4	3.6	4.32	5.0	21.6	2.3	49.68
3	.60	5	3.6	10.8	2.5	27.0	2.3	62.10
4	.20 *E.S.	3	3.6	2.16	1.25	2.7	2.3	6.21 *E.S.
5	.50	5	3.6	9.0	.6125	5.6	2.3	12.88
TOTALS			3.6	29.16		85.7	2.3	197.11

TABLE 2

Aircraft	A Factor	B Percent	C (AxB)	D (Total C)	E Segment Weight 1	2	3	4	5
2 Eng	6			13-15	10	7	5	3	2
3 Eng	10			10-12	10	5	2.5	1.25	.6125
4 Eng	15			7- 9	10	4	2	1	.5
3 Eng HBPR	5			4- 6	10	3	1	.3	.1
4 Eng HBPR	7								

The following (preliminary) forms are indicative of the type of notification which the FAA could transmit to airport proprietors, apprising them of their airport land use compatibility ratings based on Federal estimates, and advising them of actions they must take, as well as of their opportunity for appeal.

FORM 1

AIRPORT LAND USE CLASSIFICATION SYSTEM: PROPRIETOR'S NOTIFICATION OF MANDATORY COMPLIANCE

Dear Sir:

The U. S. Coast and Geodetic Survey, in cooperation with the U. S. Geological Survey and Bureau of the Census, under contract to and at the direction of the Federal Aviation Administration, has determined that U. S. International Airport has obtained a land use compatibility rating of 261.

A land use rating of 261 presently ranks 7th, between Seattle Tacoma (437) and Detroit Metropolitan (166). The Administrator is pleased to note that your facility maintains the lowest land use rating per annual operation of the 20 largest airports.

Because a land use rating of 261 makes compliance with all sections of Part ___ of FAR _____ mandatory, the Administrator encourages and invites your independent evaluation of the above classification. Please find attached one airport encroachment classification manual and the USCGS worksheets for U. S. International Airport.

This letter shall serve as notice of the Administrator's determination that you must comply with the described sections of FAR ___. Failure to contest this determination within 90 days shall constitute agreement on the part of the proprietor.

FORM II

AIRPORT LAND USE CLASSIFICATION SYSTEM: PROPRIETOR'S NOTIFICATION OF DISCRETIONARY COMPLIANCE

Dear Sir:

The U. S. Coast and Geodetic Survey in cooperation with the U. S. Geological Survey and Bureau of the Census, under contract to and at the direction of the Federal Aviation Administration, has determined that U. S. Regional Airport has obtained a land use compatibility rating of 74.

A land use rating of 74 presently ranks 35th, between Rochester, N. Y. (75) and Charlotte, N. C. (73). Because a land use rating of 74 makes compliance with Section ___, Part ___ of FAR ___ mandatory and compliance with all other sections discretionary, the Administrator encourages and invites your independent evaluation of the above classification. In addition, the Administrator solicits your participation in the determination of which sections of FAR ____ will be considered mandatory for your facility. Final determination will be made by representatives of the U. S. Environmental Protection Agency and the Federal Aviation Administration not less than 60 days or more than 90 days from this date of notice.

Please find attached one airport classification procedure manual and the USCGS worksheets for U. S. Regional Airport.

FORM III

AIRPORT LAND USE CLASSIFICATION SYSTEM: PROPRIETOR'S NOTIFICATION OF TEMPORARY EXEMPTION

Dear Sir:

The U. S. Coast and Geodetic Survey, in cooperation with the U. S. Geological Survey and Bureau of the Census, under contract to and at the direction of the Federal Aviation Administration has determined that U. S. Municipal Airport has obtained a land use compatibility rating of 16.

A land use rating of 16 presently exempts your facility from compliance with FAR ___. However, a discretionary statis will apply if a land use rating of 50 or more is obtained in the future.

Please find attached one airport classification procedure manual and the USCGS worksheet for U. S. Municipal Airport.

OUTLINE FOR THE HANDBOOK ON APPLICATION OF THE NOISE UNITS METHODOLOGY

I. Introduction

- A. Purpose
- B. Scope
- C. Structure

II. Encroachment Classification

- A. Purpose
- B. Procedure

III. The Short Form

- A. Purpose
- B. The estimation of emission levels: the proprietor's procedure.
  1. Determination of study area.
  2. Establishment of geographic sampling system.
  3. Delivery of geographic sampling system to planning agencies.
  4. Manual techniques for estimating noise emissions for the "base case."
  5. Application of the proprietor's noise emission data.
  6. Application of land use sensitivity data provided by local planning agencies.
- C. Estimating Land-Use Sensitivities: Procedure for local planning agencies
  1. The application of the proprietor's study area,
  2. The application of the proprietor's geographic sampling system.
  3. The use of general land-use characteristics in estimating actual noise units sensitivity.
  4. Criteria for estimating potential noise units for undeveloped land.
  5. Application of the proprietor's noise emission data.

IV. The Long Form

- A. Purpose
- B. Estimating emission levels: The proprietor's procedure.
  1. Application of the short form sampling system.
  2. The use of fully automated computer analysis techniques to estimate noise emissions for the base case.
  3. The use of fully automated computer analysis techniques to determine noise emissions for selected options.
  4. Application of "Long Form" land use sensitivity data provided by local planning agencies.

C. Estimating land-use sensitivity: Procedure for local planning agencies.

1. Application of the short form sampling system.
2. Factoring the specific land use characteristics and related activities.
3. Factoring for structural attenuation.
4. Factoring for transient population.
5. Factoring for ambient noise.
6. Criteria for estimating potential noise units for undeveloped land.
7. Application of noise emissions data provided by the proprietor.

V. The identification of insignificant cost abatement options.

A. Purpose
B. Applicability of the encroachment classification, the long form, and the short form.
C. The role of public participation in hearings.

It is likely that the completion of such a methodology would be closely followed by the required development and submission of a preferred implementation plan. For this reason, such requirements should be specified and clarified in the noise units methodology handbook which would suggest the appropriate format, consideration, commitment, alternative means of enlisting compliance, and the procedure for developing and submitting such a plan.

APPENDIX D

COMMUNITY NOISE PREDICTION MODEL

In the final project report, this appendix will include the developed and validated computer program, standardized aircraft data inputs characterizing aircraft noise and operational data for present and future aircraft types as required, protocol for collecting/specifying airport operational data, and associated noise prediction model computer program and computer facility access plans, to make it possible for airport proprietors and local governments to quantitatively evaluate the noise climates associated with present and alternative future modes of airport operations. In its final form, the computerized noise prediction model will contain provision for calculation of community noise from other major sources as well as airports, so that the boundary of the airport influence zone can be identified with respect to other major sources of community noise.

In the meantime, the following text section provides a sense of the activity currently under way, together with the types of airport operational data which will need to be provided by the airport proprietors in order to utilize the noise prediction model.

I. Introduction

The Community Noise Prediction Model is the mechanism which is used to integrate the influence of all of the parameters which determine the magniture of noise exposure*, as a function of geographic location, which results from any specified aviation activity pattern at an airport. This integrated approach to determining and quantifying noise exposure resulting from aviation activities at an airport has evolved from twenty years of field and laboratory research in this country and others. There are several, closely related scales which have evolved in this process 1/ 2/ including those most familiar in this country (in the same order as their sequence in the evolutionary process): Composite Noise Rating (CNR), Noise Exposure Forecast (NEF) and Day/Night Equivalent Level (sometimes called Day-Night Sound Level or Day-Night Noise Level) (Ldn).

It is EPA's intention 3/ to use the Ldn and Leq scales for quantifying community noise exposure from all sources (including airports),

* Throughout this report, the term "noise exposure" is used to indicate the existence of a noise environment regardless of whether or not there are people present within that environment; whereas the term "noise impact" is used to mean the combined result of a noise environment plus the presence of people within that environment plus the degree of noise sensitivity associated with their activities.

and encourage all Federal agencies and the various levels of government in doing likewise. By such standardization, the entire process of facility planning, community planning, development of relative priorities for source noise reduction - in fact, the entire policy guidance for a national noise abatement program - can be facilitated and made more efficient.

In developing a computerized model to quantify an airport noise situation in terms of Ldn and Leq, much time and resources can be saved by taking as the starting point an existing computer program for NEF, since all the basic physical equations (describing the movement of aircraft through the air, the propagation of sound, etc.) are the same.

The calculation of NEF values requires as input the aircraft sound level data in terms of Effective Perceived Noise Level (EPNL) measured in EPNdB. Using the same basic methodology, but expressing the aircraft sound levels in terms of the appropriate A-weighted sound levels, one can compute the resulting Leq and Ldn values.

The basic methodology used to determine NEF values has been reported in great detail in the open literature. 4/ 5/ The basic NEF methodologyhas been implemented in the form of a number of computer programs. The EPA, not wishing to develop yet another computer program unnecessarily, has surveyed and analyzed the currently available programs to determine their applicability to the Airport Noise Project.

II. Computer Programs

The EPA survey of currently available NEF computer programs indicates that four such programs are potentially applicable to this Airport Noise Regulation project. All of the four programs evaluate the same basic function, which is:

$$NEF_{ij} = EPNL_{ij} + 10\log_{10}(N_{ij}/K) - 75$$

where $EPNL_{ij}$ = EPNL due to the i^{th} aircraft on the j^{th} runway

n_{ij} = number of identical operations of the i^{th} aircraft off the j^{th} runway.

K = a constant that varies for time of day; tentatively $K = 20$ for daytime operations and 1.2 for nighttime operations

hence $$NEF_{ij} = EPNL_{ij} + 10\log_{10} M_{ij} - 88$$

where $$M_{ij} = N_{ij}\ (\text{Day}) + 16.67\ N_{ij}\ (\text{Night})$$

Although each of the four programs evaluates the basic NEF function, as shown above, each of the programs is unique with respect to input requirements, computational details and output formats. A complete description of each of the available programs is beyond both the scope and intent of the Project Report. A great deal of the uniqueness of each program is a reflection of the specific task for which it was developed. All four of the programs are capable of determining noise exposure in a grid type format and indeed this is the one capability which is common to all of the computer programs. Each of the programs can also produce noise exposure contours. In order of increasing complexity (and, by inference, increased capability) the four potentially applicable computer programs are as follows:

1. DOT Program - This program was developed to operate in a time-shared mode. Operation of the program is simple; however, the program has no graphic display capability. The strongest part of the program is its contour seeking algorithm; i.e., the program will determine the coordinates of all points which constitute a contour of predetermined NEF values. 6/ A well documented user's manual exists for this program. 7/

2. DOT/NASA Program - The basic DOT program was refined and a graphics display capability was incorporated into the coding; this effort took place at NASA Ames Research; hence, the updated program is called the DOT/NASA Program. As does the DOT Program, the DOT/NASA version operates in a time-shared mode.

This program retains the contour seeking capabilities of the earlier DOT program. Contours of constant NEF value are displayed on a Cathode Ray Tube (CRT). Once the operator is satisfied with the CRT display, a hard copy can be produced at will. Both the DOT and NASA Programs can also produce NEF values at selected grid point locations. The user's manual for the DOT program is applicable to the DOT/NASA version.

3. DOT/Wyle Program - This program was developed for use in the Airport Noise Reduction Forecast Program which is being done by Wyle Laboratories and R. Dixon Speas for DOT. 8/ The DOT/Wyle program is of the same species as the DOT and DOT/NASA programs. However, it is capable of accepting and utilizing much more detail than either of the other DOT programs. Because of its size and capability to utilize large amounts of highly detailed data, the program does not operate in the time-shared mode. While retaining the contour seeking algorithm, the DOT/Wyle program uses standard Calcomp software to create a smoothed curve through the data points.

4. USAF/NEF Program - This is a program which was developed specifically for application to military air fields; program development was under the auspices of the Aerospace Medical Research Laboratory, Air Force Systems Command. The program is well documented and a

user's manual is available. 9/ 10/ This is the most complex of the NEF programs, and like the DOT/Wyle Program, it is not time-shared and requires the use of Calcomp software to produce contours. Unlike the DOT/Wyle Program, the USAF/NEF Program only computes NEF values on a grid. A Calcomp General Purpose Contouring Program (GPCP) is used to determine the shape and location of the NEF contours from the grid point data. The program has been successfully applied to civil aviation facilities and it has been installed at the NASA Langley Research Center; unfortunately, a GPCP package is not now available at Langley.

EPA/ONAC staff have hands-on experience with the DOT, DOT/NASA and USAF/NEF programs. Although the EPA/ONAC staff have had no experience with the DOT/Wyle program, they are familiar with development of the program, its input/output characteristics and the available documentation.

As of this date, EPA/ONAC had not selected a specific computer program for use in the Airport Noise Regulation development. It is our intent to use at least two of the available computer programs during the Airport Pilot Project in order to quantify the requirements for computational precision and to evaluate which of the program operational modes is best suited to routine use in support of the regulation during its implementation; e.g., to time-share or not to time-share?

At first glance, it might appear that the use of more than one noise model would overly complicate the Airport Pilot Project; e.g., specific instructions and manuals would be required for each model. However, a close inspection of the four computer programs reveals an amazing similarity in their input requirements. Perhaps the similarity is not all that amazing since each of the programs computes NEF and basically, there is only one way to do this.

For example, all NEF calculations require input data in the form of EPNdB vs the distance between source and receiver. Each of the programs is fully capable of analyzing the effects of power reduction on noise impact; i.e., in one form or another, each program can relate source sound level to engine power level. Two of the four programs utilize a "curve" of sound level vs. percent of full power. The third program uses an input quantity which specifies " EPNdB down" due to thrust reduction along the flight path.* The fourth program uses a set

* The term "flight path" means the path of an aircraft through the air, specified in three-dimensional coordinates. The flight path can be expressed in its two parts: (1) the "flight track" (or track of the aircraft over the ground, as seen in plan view, from above) and (2) the "flight profile" (e.g., climbing, descending or in level flight - as seen from a side view).

of EPNdB vs. distance relations for various thrust levels and interpolates between known "curves" to determine the sound level vs. distance relation for the specified engine thrust level.

These three methods of evaluating the effect of engine power level on source sound level all require the same basic data and differ only by the trading off of analyses performed prior to using the program against data storage and manipulation within the program; e.g., in order to develop a "curve" of sound level vs. engine power level, one must have sound level data for several engine power levels and, if one has that data, one can easily determine the Δ EPNdB due to engine power level changes.

To a very large extent, the difficulties inherent in working with the NEF data, especially with source sound level data, are a reflection of the belief of the potential user that the data are hard to work with. Hence, application of the Community Noise Prediction Model to this project requires a well conceived data management plan.

III. Data Management

From the management point of view, there are two distinct types of data which enter into airport noise exposure calculation: (1) those elements of data which describe the airport facility and the operation of aircraft in the vicinity of that facility and (2) those data which describe the sound level characteristics of specific aircraft when they are operated in a equally well specified manner.

The necessary elements of the first data (airport data) are as follows:

1. Airport configuration in terms of the location of the runways with respect to a given reference point.

2. Location of the landing thresholds and start of takeoff roll on each runway. If there are several thresholds or start-of-roll points corresponding to different types of aircraft, these must be noted.

3. Flight tracks; i.e., the projection on the ground of the paths followed by arriving and departing aircraft.

4. Restrictions due to airspace management, curfews, etc.

5. Number of operations by type of operation (landing, takeoff, touch-and-go), by aircraft type, by runway, by time of day, by flight track.

6. Seasonal variations in basic facility operational patterns.

7. Flight profiles; i.e., aircraft altitude as a function of distance from start-of-roll or distance to touchdown. Flight profile descriptions imply a knoweldge of the parameters which affect aircraft performance; e.g., weight, thrust, flap management, etc.

The elements of the second data (aircraft data) set are as follows:

8. The relationship of aircraft sound level to distance between source and receiver for both landing and takeoff operations, including the effect of engine power level changes on the source sound levels.

The EPA will supply all of the aircraft sound level data used in the Airport Pilot Project. At this time, the EPA is developing an aircraft sound level data bank. The data bank contents can be used with any of the available computer programs since it is only the data format which varies between programs. The sound level data bank is a continuing effort and it will be broadened to include all classes of aircraft. The sound level data bank was started for two major reasons: (1) the EPA desires to use a "standardized" set of aircraft sound level data and (2) the airport operator cannot be expected to be able to supply such data. In a similar manner, it is probably unreasonable to expect the airport operator to be a good source of any aircraft performance data; i.e., the specifics of aircraft performance are not generally within the realm of the airport operator's sphere of cognizance. Hence, the EPA has also undertaken the development of a methodology which can be used to determine flight profiles as a function of basic aircraft characteristics and operating environment; e.g., takeoff gross weight, runway elevation, outside air temperature, etc. This methodology should be operable in time for application to the Airport Pilot Project.

IV. Data Collection Protocol

Other than the EPA supplied "standardized" data such as sound level data and flight profile data, the burden of the data collection effort will fall upon the airport operator. The weight of this burden is not overwhelming if one remembers that data collection (like many other activities) obeys the law of diminishing returns. Specific elements of the necessary data are easy to come by, other elements are more difficult to obtain; however, in many cases the difficult to obtain data elements can be approximated without significant loss of accuracy in the results.

In the following, each of the major data elements is addressed with respect to its characteristics and potential sources:

A. Runways

Runway locations are specified relative to a specific reference coordinate system. The end points of the runways must be specified

with respect to the fixed reference. These data are the least difficult to obtain and can be taken directly from the facility site plans, C & GS charts, etc.

B. Landing Threshold-Distance From End of Runway

The landing threshold is the point on the runway where the aircraft will touch down upon landing. For any runway, the touchdown point is often assumed to be the same for all aircraft landing on that runway. (It is simple to verify the threshold location by inspection; the threshold is where all the rubber is on the runway surface, provided a runway cleaning project has not recently removed it.) Other than simple inspection, the rule which is generally applied to determine threshold location is that the touchdown point is that distance from the end of the runway which would permit an aircraft to clear a hypothetical 50 foot barrier at the end of the runway. In some cases, a special threshold location will have been designated for a particular runway. In any event, the airport manager should be contacted to verify the thresholds being used.

C. Start of Takeoff Roll

As with the touchdown point, the point on the runway where the takeoff generally starts is determined by procedures set forth by the airport manager. Normally, most airports utilize the full runway length for operations, and the takeoff roll starts at the point at which the aircraft turns onto the runway. Thus, the distance to the start of roll is usually specified as zero unless otherwise designated.

D. Flight Track

For airports with an FAA Control Tower, the location of the major flight tracks can be obtained from the FAA Tower Chief at the airport. In addition to the Tower Chief, the Airport Manager is also a potential source of flight track information.

Flight track information is usually more readily available at airports which already have a noise problem since the airport management has already learned the importance of flight track location to the incidence of noise impact. At smaller airports, without an FAA Control Tower and/or without noise problems, flight track information may consist of data like, "fly out to the river and turn right so that you follow the railroad tracks." This is valid data and often it is just as accurate as thatwhich is available from more sophisticated data sources.

Without regard to its source, unless it is flight-by-flight radar track information, flight track data contains certain inherent "errors" which arise from the dispersion of actual aircraft flight tracks about the specified or "average" track. For example, although pilots are instructed to follow a prescribed course, the aircraft may wander from

the prescribed path; this phenomenon is also noted with respect to flight profiles. If the radar track information for a large number of flights, all of which were supposed to be on the same track, were plotted on a single sheet of paper, the result would not be a single heavy line along the track: This is dispersion. The effects of dispersion can be modeled by distributing the flights which are assumed to follow one track among several tracks. However, what should the distribution look like and where are the other tracks? "Guesstimating" data is probably not better than assuming that all of the flights follow the prescribed track. Hence, airport noise modelling is usually based upon the assumption that all aircraft assigned to a track follow that track. It should be noted that, in some cases, radar track information does exist and such data then can be used to determine the flight track dispersion.

E. Restrictions

Restrictions come in many forms such as night curfews, avoiding the overflight of designated areas, altitude restrictions, etc. Again, the airport manager and the FAA Tower Chief, if there is a tower, are the prime sources of such data. Each of the air carriers using the facility should also be questioned about operating restrictions such as deck-angle limitations, power cut backs, etc.

F. Number of Operations

The activity level of the airport must be described in terms of the number of operations in some unit time period; the customary statistic is the annual average daily number of operations. Each operation must then be described according to the following scheme:

- Type of aircraft - in order to specify the appropriate noise level data.
- Gross takeoff weight - in order to aid in the specification of a takeoff profile. Gross landing weight is not needed since all (large) aircraft will use a path which corresponds approximately to the glide slope, if dispersion effects are neglected.
- Type of operation; i.e., landing or takeoff - in order to model the correct operation.
- Runway and flight track - in order to properly allocate the location of aircraft around the facility.
- Time of day - in order to properly weight the noise exposure according to the accepted conventions.

Activity data can be in one of two forms, either direct tallies counting each flight, or aggregate estimates for the entire airport and flight track utilization rates for each type of aircraft. A number of data sources exist which provide some of the data. No single source exists for all of the necessary elements of the data.

The FAA and CAB issue an annual report entitled Airport Activity Statistics of Certified Route Air Carriers which contains, among other data, a listing of the number of scheduled departures performed, by carrier, by airport, by aircraft type. These data are historical and do not necessarily reflect the current activity level at the airport. The activity level report is compiled from information reported to the CAB by the certified route air carriers.

A data source for determining current activity levels is the Donnelley tapes. The Donnelley tapes contain the schedules provided by the airlines to the Reuben H. Donneley Corporation and are used to construct the Official Airline Guide. From these tapes one could construct a schedule of commercial arrivals and departures for an airport by aircraft type. With some additional analysis of the tapes, one could determine the total stage lengths covered prior to arrival. Stage length has been used as a proxy variable for aircraft weight. Weight data may also be available in the form of landing fee data, if landing fees are collected and if the data are available.

Scheduled operations are not the same as actual operations; however, the correlation between the two is quite high for scheduled air carriers. The percentage of scheduled departures will vary by airport; however, one can assume an overall departure rate of 95 percent of scheduled operations; an error of plus or minus 5% will not perceptibly affect the noise exposure estimates.

As noted before, the statistic which is generally used is annual average daily operations. An error is introduced into the impact forecast by the use of the annual daily average. If one is interested in maximum exposure, then peak activity levels must be used; there may be important seasonal variations in activity level which are smoothed out by using the annual average daily activity level, resulting in a slight underestimate of annual exposure. Assuming that the ratio of peak to average day is same for all aircraft types, a doubling of the activity level will increase the NEF value by 3. If the peak to average ratio approaches 3, the increase in NEF would be about 5 units.

Thus far, this discussion has centered on data which are most related to numbers of operations (for annual activity data or airline schedules), aircraft types (from airline schedules), and possibly weight (from stage length or fee data). Schedule data also provides information on the time of day of the operation. All of these data are useless unless the aircraft operations can be assigned to particular runways

and flight tracks. Once more, we return to the Control Tower, because the aircraft assignments come from the tower.

Aircraft runway assignments depend upon many factors such as the ability of the runway to accommodate particular sizes of aircraft, origin, destination, wind direction, congestion, etc. If there is only one runway, the problem is somewhat simplified since the only remaining data item is concerned with the flight tracks. If there is only one inbound track and one outbound track, there are no data problems, but this is a rare situation. Again, the ultimate resolution of the aircraft allocation problem resides in the tower as does the determination of the shape and location of the tracks to which the aircraft are assigned.

With respect to this element of data, as well as all of the others, the Airport Pilot Project will feed upon itself in that we have a practical understanding of the availability of the necessary data and how it can be acquired - the Pilot Project will serve to fine-tune that understanding into a practical working data system concept.

G. Flight Profiles

The manner in which an aircraft is operated has a major effect on the noise exposure around the airport. The only sources of flight profile data and engine operations information which provide anything more than a gross average data set are the airlines and the manufacturers. The EPA is also developing a flight profile data base and the methodology needed to generate flight profiles from basic performance data. These data, or any other data set, must be augmented by specific instructions which the air carriers may provide to their pilots. In the absence of flight profiles which are specific to the individual facility, the EPA will be able to provide "typical" flight profiles.

V. Data Collection Manual

The EPA will provide a manual suited to each of the computer programs which may be applied to this project providing guidance for the specifying or collecting of airport operational data. The manual will be totally directed at assisting the involved parties in collecting and organizing the necessary data into the format which is required by the computer analysis.

The basic format of the manual, as it is now envisioned, is centered on a set of formalized data collection forms for airport configuration, flight tracks and activity level. Each form will be augmented by text material which indicates data sources, alternate data sources, and what to do if no data is available. "User's Manuals" exist, to one degree or another, for each of the available computer programs, but in general they do not extend to the types of guidance needed by non-engineering personnel. The necessary portions of the existing documentation will be abstracted to provide a basis for the development of a Community Noise Prediction Model Data Collection Manual.

VI. Aircraft Data Standardization

EPA has accepted the responsibility for a critical review of the existing noise characteristic data for current aircraft, followed by a resolution of any identified errors or inconsistencies, in order to provide a "standard Federal data set" representing the noise characteristics of specific aircraft types.

Such an evaluated, standardized data set is necessary if major noise abatement plans at airports are to be based upon calculated noise exposure environments. The cooperation of the FAA, NASA, DOD, aircraft manufacturers and relevant professional society committees (such as the SAE A-21 Committee) makes such a standardization possible.

The noise characteristic data for future aircraft types depends upon the outcome of Federal regulatory actions in aircraft noise emission control. Of foremost importance, in terms of magnitude of effect upon attempts to develop meaningful long range noise abatement plans at airports, are the outcome (effective dates and specific limits) in the anticipated retrofit rule, noise abatement flight procedure rules, and lowering of limits for new aircraft (FAR 36). At general aviation airports, the establishment of noise emission limits for propeller-driven aircraft and the question of retrofit for business jets have a strong bearing upon airport plans for noise abatement or avoidance of future noise impact problems. Therefore, it is important that early Federal decisions be made on all these regulatory actions, in order that local airport and community plans be based upon realistic assumptions.

During the course of the airport noise regulation development, and in the Airports Pilot Project, EPA will utilize noise characteristic data for future aircraft types which we deem most likely outcomes of current Federal regulatory actions under way. In each case, the amount of uncertainty in these numbers will always be stated and the range of effect of these uncertainties upon airport noise impact reduction will be illustrated by example cases.

VII. Model Validation

Rest assured that EPA will not submit an airport noise regulation to FAA for promulgation without having first verified the accuracy of the noise prediction model based on field measurements. The risks of adopting airport noise abatement plans, wherein major cost consequences may be associated with significant errors in noise exposure calculation, are too great.

Fortunately, there is a significant and growing body of field-measured data from existing airport noise monitoring systems and from the DOD's AICUZ program; so that a large effort in new field data acquisition may not be required. However, the Airports Pilot Project must

begin prior to this validation. Hence, the numerical results from noise exposure computations for specific airports in the pilot project must be regarded as "preliminary" even though their general magnitude (based on past experience in applying such prediction models) are expected to be close approximations to what would be measured in a properly designed monitoring effort.

1/ "Noise Exposure Forecasts: Evolution, Evaluation and Land Use Interpretation", FAA Report NO-70-9, August 1970.

2/ "Impact Characterization of Noise Including Implications of Identifying and Achieving Levels of Cumulative Noise Exposure", EPA NTID 73.4, July 27, 1973.

3/ "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", EPA Technical Document 550/9-74-004, March 1974.

4/ "Procedures for Developing Aircraft Noise Exposure Contours Around Airports", Society of Automotive Engineers, Draft ARP 1114, March 1970.

5/ "A study of the Magnitude of Transportation Noise Generated and Potential Abatement", U.S. Department of Transportation, Report No. OST-ONA-71-1, Vol. III -- Airport/Aircraft System Noise, Nov. 1970.

6/ Ibid.

7/ "Airport Noise Exposure Contour Model User's Manual", H.B. Safeer and L.J. Williams, DOT Report No. OST-ONA-72-3, August 24, 1972.

8/ "Airport Noise Reduction Forecast Program, Report for Six Airports", Wyle Laboratories, submitted to US DOPT, Office of the Secretary, under Contract No. DOT-OS-20088, July 1973.

9/ "Community Noise Exposure REsulting from Aircraft Operations: Computer Program Operator's Manual", N. H. Reddingues, Bolt, Beranek and Newman, Inc. Technical Report AMRL-TR-73-108, Pre-publication copy, July 1973.

10/ "Community Noise Exposure Resulting from Aircraft Operations: Computer Program Description", R.D. Horonjeff, R.R. Kandukuri and R.H. Reddingues., Bolt, Beranak and Newman, Inc., Technical Report AMRL-TR-73-109, Pre-publication copy, September 1973.

APPENDIX E

ONE POTENTIAL METHOD OF EVALUATING THE DEGREE OF RELIEF TO THE PUBLIC HEALTH AND WELFARE AFFORDED BY ANY PROPOSED REGULATORY ACTION

There are a number of possible ways of quantifying the change in the public health and welfare impact due to any potential noise regulation under consideration. For example, given adequate data on approximate noise exposure patterns (as might be obtained from prediction models or surveys) together with approximate information on land use patterns associated with the noise exposure zones, one could approximately quantify the change in the number of people exposed to various intensities of cumulative noise which would result from implementing any given noise regulation under consideration.

In the final version of the project report for the airport noise regulation, the results of such studies will be presented for several alternative regulatory proposals. The opportunity is taken here, however, to obtain early public comment on one potential method of expressing, in single number form, the effectiveness of a given regulatory action by a method which allows the combining of populations exposed to varying intensities of cumulative noise exposure.

Such a technique can be applied on any scale (e.g., for approximate nationwide estimates or for evaluation of alternative noise abatement plans for a specific airport) and for any source, or combined sources, of community noise.

In this appendix, a proposed method of evaluating the effect on the public health and welfare arising from a change in noise exposure (expected from a proposed regulatory action) is set forth for comment. The approach taken is statistical in that an effort is made to determine the order of magnitude of the population which may be affected by the proposed action. Thus, there will exist uncertainties with respect to individual cases or situations. However, such effects cannot be completely accounted for, thus the necessity to employ a statistical approach.

To perform the analysis presented here, a noise measure is utilized which condenses the information contained in the noise environment into a simple indicator of quantity and quality of noise which, in EPA's judgement, correlates well with the overall long-term effects of noise on the public health and welfare. This measure was developed as a result of the Noise Control Act of 1972, which required that EPA present information on noise levels "requisite to protect the public health and welfare with an adequate margin of safety."

In accordance with this directive, EPA has selected those noise measures it believes most useful for describing environmental noise and its effect on people, independent of the source of the noise. The noise produced, whether by motor vehicles, aircraft or industrial facilities, is evaluated on the basis of a common measure of noise. The magnitude of environmental noise that EPA considers desirable from a long-term view of public health and welfare (prior to consideration of economics or other practical constraints) has been selected for a variety of occupied spaces and land uses.

In the following sections is a brief description of the measures to be used in evaluating environmental noise, the numerical values for these levels EPA will use as thresholds for assessing impact, and a general methodology for quantifying the noise impact of any noise-producing system being added to the environment, or the impact of a change in an existing noise-producing system. Finally, we will develop a specific application of this methodology to assess the effects of the proposed regulations on airport communities. Since economics and feasibility of remedial action will be treated elsewhere in the development of the regulation, we consider here only the health and welfare impact.

A. How Environmental Noise Is Specified

Environmental noise is defined in the Noise Control Act of 1972 as the "intensity, duration, and the character of sounds from all sources." A measure for quantifying environmental noise must evaluate not only these factors, but must also correlate well with the various response modes of humans to noise and be simple to meaure.

EPA has chosen the equivalent A-weighted sound level in decibels as its basic measure for environmental noise. The general symbol for equivalent level is Leq, and its basic definition is:

$$L_{eq} = 10 \log_{10} \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p^2(t)dt}{P_o^2}$$

where t2-tl is the interval of time over which the levels are evaluated, P(t) is the time-varying sound pressure of the noise, and Po is a reference pressure, standardized at 20 micropascal. When expressed

in terms of A-weighted sound level, L_A, Leq may be defined as:

$$L_{eq} = 10 \log_{10} \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} 10^{\frac{L_A(t)}{10}} dt$$

There are two time intervals of interest in the use of Leq for impact assessment. The primary interval of interest for residential and similar land uses is a twenty-four hour period, with a weighting applied to nighttime noise levels to account for the increased sensitivity of people associated with the decrease in background noise levels at night. This twenty-four hour weighted equivalent level is called the Day/Night Equivalent Level, and is symbolized as Ldn.* The basic definition of Ldn in terms of A-weighted sound level is:

$$L_{dn} = 10 \log_{10} \frac{1}{24} \left[\int_{0700}^{2200} 10^{\frac{L_A(t)}{10}} dt + \int_{2200}^{0700} 10^{\frac{L_A(t)}{10}} dt \right]$$

$$L_{dn} = 10 \log_{10} \frac{1}{24} \left[(15 \times 10^{(L_d/10)}) + (9 \times 10^{(L_n+10)/10}) \right]$$

where Ld is the "daytime" equivalent level, obtained between seven a.m. and ten p.m. and Ln is the "nighttime" equivalent level obtained between ten p.m. and seven a.m. of the following day.

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* Note: Ldn is an abbreviation for "day-night equivalent level," which is obtained from accumulating the A-weighted acoustical energy (received at a point) over a 24-hour period and computing an average level over the accumulation time, after artificially increasing the time-varying noise levels received during the night (10:00 p.m. to 7:00 a.m.) by 10 decibels. Values of Ldn may be measured or computed for any multiple of 24 hours; the monthly, quarterly and/or yearly Ldn may be especially of interest in the airport/community noise application.

B. Assessing Impact From Environmental Noise

The underlying concept for noise impact assessment in this analysis is to relate the change in expected impact in terms of number of people involved to the change expected in the noise environment. Three fundamental components are involved in the analysis: (a) definition of initial acoustical environment; (b) definition of final acoustical environment; (c) relationship between any specified noise environment and expected human impact.

The first two components of the assessment are entirely site or system specific, relating to either estimates or measurement of the environmental noise before and after the action being considered. The same appropach is ued, conceptually, whether one is examining one single house near one proposed road, the entire highway system, or the totality of the nation's airports. The methodology for estimating the noise environment will vary widely with the scope and type of problem, but the concept remains the same.

In contrast to the widely varying possible methodologies for estimating the noise environment in each case, the relationships to human response can be quantified by a single methodology for each site or noise producing system considered in terms of the number of people in occupied places exposed to noise of a specified magnitude. This is not to say that individuals have the same susceptibility to noise; they do not. Even groups of people may vary in response depending on previous exposure, age, socio-economic status, political cohesiveness and other social variables. In the aggregate, however, for residential locations the average response of groups of people is quite stabely related to cumulative noise exposure as expressed in a measure such as Ldn. The response we use is the general adverse reaction of people to noise. This response is a combination of such factors as speech interference, sleep interference, desire for a tranquil environment, and the ability to use telephones, radio, and TV satisfactorily. The measure of this response is related to the percent of people in a population that would be expected to indicate a high annoyance to noise at a specified level of noise exposure.

For schools, offices, and similar spaces where criteria for speech communication or risk of damage-to-hearing is of primary concern, the same averaging process can be used to estimate the potential response of people as a group, again ignoring the individual variations of one person as compared to another. In both instances then, residential areas and non-residential alike, we are interested in how the average response of people varies with environmental noise exposure.

A detailed discussion of the relationships between noise and human response is provided in several EPA documents. The different forms of response to noise such as hearing damage, speech or other

activity interference, and annoyance are related to Leq and Ldn in EPA's "levels document". For our purposes, we consider that if the levels identified in this document are met, no impact exists.

The community reaction and annoyance data contained in Appendix D of the levels document show that the expected reaction to an identifiable source of intruding noise changes from none to vigorous when the day-night sound level increases from 5 dB below the level existing without the presence of the intruding noise to 19.7 dB above the pre-intrusion level. When the combined values of intruding noise level and pre-intrusion noise level are considered, the change in community reaction from none to vigorous occurs when the level increases by 19.7 dB above the pre-intrusion level. Thus, a change of 20 dB is a reasonable value to associate with a change from 0 to 100% impact. Such a change in level would increase the percentage of the population which is highly annoyed by 40% of the total exposed population.

For speech communication, an exposure intensity scaling can also be derived. The level of environmental noise identified as requisite to protect the public health and welfare with reference to speech communication indoors is an Leq of 45 dB. A noise environment having this level should provide, on the average, 100% speech intelligibility for all types of speech material, and have a calculated articulation index of 1.0.

The intelligibility for sentences (first presentation to listeners) drops to 90% when the level of the noise environment is increased by approximately 19 dB above the level identified in the levels document, and to 50% when the level is increased by approximately 24 dB. The intelligibility for sentences (known to listeners) drops to 90% when the level is increased by approximately 22 dB above the identified level, and to 50% when the level is increased by approximately 26 dB. Thus, considering that normal conversation contains a mixture of both types of material, some new and some familiar, it is clear that when the level of environmental noise is increased by more than 20 dB above the identified level, the intelligibility of conversational speech deteriorates rapidly with each decibel of increase. For this reason, a level which is 20 dB above the identified level is considered to result in 100% impact on the people who are exposed. For environmental noise levels which are intermediate between 0 and 20 dB above the identified level, the impact is assumed to vary linearly with level, i.e., a 5 dB excess constitutes a 25% impact and a 10 dB excess constitutes a 50% impact.

For convenience of calculation, these percentages may be expressed as fractional impact (FI): an FI of one represents an impact of 100%, in accordance with the following formula:

$FI = 0.05\ (L - Lc)$ for $L > Lc$
$FI = 0$ for $L \leq Lc$

Where L is the appropriate value for the environmental noise (i.e., Ldn or Leq) and Lc is the appropriate identified level. (Note that FI can exceed unity.)

The appropriate identified level for use in calculating fractional impact is obtained from Table 4 of the EPA levels document. For the analysis of the impact of community noise on people residing in residential areas the appropriate identified level is an Ldn of 55 dB, which is measured outdoors. For other analyses concerned with office buildings and other types of space when indoor speech communication is the principal factor of concern, the identified level is an Leq of 45 dB (indoors), which is translated to an outdoor level by using a sound level reduction appropriate to the type of structure. For the purpose of evaluating the airport system throughout the nation in general, rather than the effect of a particular airport in a particular region, the analysis may be made in terms of Ldn above, since only a gross analysis may be possible.

Data on the reduction of aircraft noise afforded by a range of residential structures are available. (2) These data indicate that houses can be approximately categorized into "warm climate" and "cold climate" types. Additionally, data are available for typical open-window and closed-window conditions. These data indicate that the sound level reduction provided by buildings within a given community has a wide range due to differences in the use of materials, guilding techniques, and individual building plans. Nevertheless, for planning purposes, the typical reduction in sound level from outside to inside a house can be summarized as follows in Table B-1. The approximate national average "window open" condition corresponds to an opening of 2 square feet and a room absorption of 300 sabins (typical average of bedrooms and living rooms). This "window open" condition may be assumed in estimating conservative values of the sound levels inside dwelling units which result from outdoor noise.

TABLE 1

SOUND LEVEL REDUCTION DUE TO HOUSES* IN WARM AND COLD CLIMATES, WITH WINDOWS OPEN AND CLOSED(2)

	Windows Open	Windows Closed
Warm climate	12 dB	24 dB
Cold climate	17 dB	27 dB
Approx. national average	15 dB	25 dB

*(Attenuation of outdoor noise by exterior shell of the house)

Where knowledge of structure indicates a difference in noise reduction from these values, the criterion level may be altered accordingly.

The final notion to be considered is the manner in which the number of people affected by environmental noise is introduced into the analysis. The magnitude of the total impact associated with a defined level may be assessed by multiplying the numbers of people exposed times the fractional impact associated with the level of the environmental noise, as follows:

$$NU = (FI)\ P$$

where NU (or "Noise Units") is the magnitude of the total impact on the population and is numerically equal to the equivalent number of people which have a fractional impact equal to unity.

FI is the fractional impact for the level and P is the population affected by the noise. Note that the effect of the fractional impact is to count these people who are heavily impacted more than those who are only marginally impacted.

When assessing the total impact of a given noise source or an assemblage of noise sources such as an airport the levels of environmental noise associated with the source(s) decrease as the distance between the source and receiver increase. The magnitude of the total impact may be computed by determining the Noise Units corresponding to the group of people exposed at each exposure level, and summing the resulting Noise Units over all exposure levels. The total impact is given by the following formula:

$$\sum NU = \sum_i (FI)_i\ P_i$$

where (FI)i is the fractional impact associated with the ith level and Pi is the population associated with the ith level.

The change in impact (or change in total Noise Units) which is associated with an action leading to noise reduction, or change in population through a change in land use, may be assessed by comparing the magnitude of the impacts for the "before" and "after" conditions. One useful measure is the percent reduction in impact (Δ), which is calculated from the following expression:

$$\Delta = \left[NU(\text{before}) - NU(\text{after})\right] / NU(\text{before})$$

Note that the percentage change may be positive or negative depending upon whether the impact decreases (positive change) or the impact increases (negative change).

Thus, a 100 percent positive change in impact means that the environmental noise has been reduced such that none of the population is exposed to noise levels in excess of the identified levels.

In order to place this concept in perspective, consider a simple example. In the recent EPA study on Population Distribution of the United States as a Function of Outdoor Noise Level (to be published shortly), an estimate is provided for the number of people in the United States exposed to various levels of urban noise. We can use the above concepts to illustrate the current impact of this exposure, and then assess the change in impact if all noise sources were reduced 5, 10, or 15 decibels. In the following computation we take the data from this study defining each Pi as the population between successive 5 decibel increments of Ldn, assigning this population an exposure level midway between successive Ldn increments. For this example, the identified level is an Ldn of 55 dB measured outdoors.

TABLE 2. ESTIMATE OF THE IMPACT REDUCTION EFFECTIVENESS OF SUCCESSIVE REDUCTION OF ALL URBAN NOISE SOURCES IN 5 DECIBEL STEPS

	Current conditions		Noise reduction in decibels							
L_{dn} (dB)	Population exposed to higher L_{dn} (millions)	P_i (millions)	FI_i	FI_iP_i (millions)	FI_i -	FI_iP_i (millions	FI_1	FI_iP_i (millions)	FI_i -	FI_iP_i (millions)
55	93.4	34.4	0.125	4.3	0	0	0	0	0	0
60	59.0	34.7	0.375	13.0	0.125	4.3	0	0	0	0
65	24.3	17.4	0.625	10.9	0.375	6.5	0.125	2.2	0	0
70	6.9	5.6	0.875	4.9	0.625	3.5	0.375	2.1	0.125	0.7
75	1.3	1.2	1.125	1.4	0.875	1.1	0.625	0.8	0.375	0.5
80	0.1	0.1	1.375	0.1	1.125	0.1	0.875	0.1	0.625	0.1
Total Noise Units (millions)				34.6		15.5		5.2		1.3
Percent reduction in impact				0		55		85		96

The results, provided in Table 2, show that a 5 dB noise reduction results in a 55% reduction in impact, a 10 dB noise reduction results in an 85% reduction in impact and a 15 dB noise reduction results in a 96% reduction in impact.

The impact assessment procedure may be summarized by the following steps:

1. Estimate the Leq or Ldn produced by the noise source system as a function of space over the area of interest.

2. Define sub-areas of equal Leq or Ldn, in increments of 5 decibels, for all land use areas.

3. Define the population, Pi, associates with each of the sub-areas of step 2.

4. Calculate the FIi values for each Ldni and Leqi obtained in step 2.

5. Calculate FIi x Pi for each sub-area in step 2.

6. Obtain the total Noise Units for the condition existing before the change being evaluated, NU1 = FIi x Pi, by summing the individual contributions of step 5.

7. Repeat steps 1-6 for the noise environment existing over the area of interest after the change being evaluated takes place, thus obtaining NU2. (Note that the sub-areas defined here will not in general be congruent with those of step 2 above.)

8. Obtain the percent reduction in impact from

It should be emphasized again that this procedure is purely an assessment methodology for quantifying changes in impact (to the public health and welfare with respect to noise only) due to actual or hypothesized changes in the community noise environment. The amount of change in this impact which is appropriate to expect from any given regulatory action is dependent upon many other competing requirements. These include, but are not limited to, technological feasibility, economic reasonableness, and other expressions of the general public welfare needs such as demand for transportation, housing, land and energy resources, and other environmental considerations.

REFERENCES

(1) ANSI S 3.5 5-1969 American National Standard, Methods for the Calculation of Articulation Index, p. 23.

(2) "House Noise-Reduction Measurements for Use in Studies of Aircraft Flyover Noise," Society of Automotive Engineers, Inc., AIR 1081, October 1971.

APPENDIX F

PROPOSED MODEL LEGISLATION FOR

POSITIVE STATE/LOCAL CONTROL OF LAND USE/BUILDING DESIGN

Since the formation of an Office of Noise Abatement and Control in EPA, there has been a continuing activity to provide technical assistance to state and local governments in the establishment of their own noise control programs and improvement of their abilities to take account of community noise in their general activities, such as transportation planning and land use control.

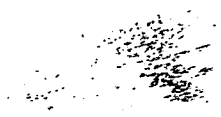
This technical assistance activity takes many forms, including the provision of training courses, development of model laws and ordinances, development of low-cost instrumentation for noise measurement, and direct technical assistance (on request) from our Regional Offices.

In the area of model laws and ordinances, the first major product was model state enabling legislation for noise control, resulting from two years of joint effort between EPA and the Council of State Governments. 1/ This model bill calls for the development of comprehensive statewide programs of noise regulations, and envisions local government participation in such programs. Its provisions include, among others, the establishment of ambient noise standard (zones) and for the establishment of special (building) noise insulation districts. It specifically calls upon state agencies and local governments to exercise their powers, to the extent not preempted by Federal law, to alleviate and prevent community noise impact from airports.

The second step in this program of developing model legislation is currently under way: A public task group, chaired by EPA, is developing a model noise ordinance for local governments. 2/ The planned model local noise legislation will be flexible enough to be used by small communities (under 25,000 population), medium size communities (25,000 to 75,000 population), larger cities (over 75,000 population), counties or regional agencies.

Conceptual steps are presented to guide the community to the development of noise legislation most suitable for its particular problems, enforcement capability and budget.

One of the major areas of concern in the model noise legislation is the control of land use around major noise sources (e.g., highways, airports). Several provisions have been included to control the land use problem. First, a provision requiring the identification of high noise areas as determined from guidelines or recommended practices set forth by the appropriate Federal Agency (e.g., EPA, FAA, FHWA, HUD, etc.). Areas that are designated "High Noise Areas" will require a site noise study to determine land use classification; a further requirement will place use restrictions in high noise areas.



Last, a "Truth in Lending" regulation is suggested to provide the intended purchaser of real property with advance information on the present and projected future level of the noise exposure upon the parcel of land being considered for purchase.

In the coming fiscal year additional model legislation is planned for noise control within buildings to complement the model state and local noise regulations. With respect to the airport noise regulation program, the importance of this effort is that it will provide the basis for amending building codes (and possibly housing codes) to specify noise insulation performance of building structures as a function of building use and level of the exterior noise environment.

REFERENCES

1. "State Noise Control Act," Suggested State Legislation, Vol. XXXII, The Council of State Governments, Lexington, Kentucky, 1974.

2. Community Noise Handbook (Draft), EPA Issuance, Fall 1974.

APPENDIX G

THE AIRPORTS PILOT PROJECT

In the final project report, this appendix will consist of EPA staff and contractor reports on the airports pilot project. For this draft, a description is provided of the purposes and status of this project.

It is EPA's intention to develop not only the airport noise regulation itself (together with its supportive studies), but also certain supplemental plans and supportive implementation tools which will be required for the successful implementation of the regulation. Further, we intend to provide a functional test of one or more forms of the draft regulation and draft versions of certain implementation tools prior to their finalization and proposal to the FAA. This functional test will be performed in an Airports Pilot Project, involving some eight to twelve airports, in which the process of developing a "preferred implementation plan" for the airport will be carried out just as if a Federal airport noise regulation already had been promulgated and the airport proprietor had been directed by the FAA to develop and submit such a plan.

In this Airports Pilot Project, the objective will be to identify changes, clarification and previously unrecognized problems in the draft regulation and particularly in the associated tools and processes, and based on this experience, to improve the regulatory package. No actions will be taken actually to carry out any of the facets of the airport implementation plans so developed.

The sample of airports to be included in the pilot project should be as representative as possible of the span of airport characteristics which may affect both the appropriate structure for the regulation and the recommended process for development of airport implementation plans under the promulgated regulation. Therefore, in EPA's selection of preferred candidate airports for the pilot project, the following sampling objectives are being utilized:

1. Include airports with both large and small potential for preventive measures.

2. Include airports over a range of magnitude of present impact.

3. Include airports of various types by dominant aircraft use.

   a. Primarily certified air carrier.

   b. General aviation only, with heavy business jet use.

   c. General aviation only, at threshold/decision on business jet use.

d. International air carriers use of airport.

e. Civil - military joint use, with military activity a major contributor to the noise impact.

f. STOL-port or heliport.

g. Marginal air carriers use (on order of 5-10 flights per day), possibly on verge of phasing air carrier use down or out.

4. Include one airport from each state with (markedly differing) existing state institutional mechanisms for land use control affecting airports. These include: Florida, California, Minnesota and Hawaii. (The State of Washington has new airport land use control legislation pending.)

5. Include airports with significant growth potential (based on economic growth outlook of the region, and absence of physical constraints).

6. Include one airport in each of the following situations:

   a. "Brand X" - on the verge of a decision to become a civil airport (i.e., a new siting decision or a surplus military field).

   b. "Brand Y" - on the verge of a decision to phase out as an airport.

7. Include airports with both simple and complex political jurisdiction pattern regarding control of surrounding land uses.

8. Include airports from both ends of the spectrum in terms of :

   a. Probable airport staff resources related or relatable to the noise problem.

   b. Probable local government planning and land use control agency staff resources related or relatable to the noise problem.

9. Include airports from both ends of the spectrum in terms of:

   a. Apparent interest in resolving/preventing noise impact problems.

b. Probable desire to participate in the airports pilot project.

A group of candidate airports has been identified by EPA such that this set of characteristics can be sampled in a set of eight to twelve airports. The EPA will approach the selected airports' managements and solicit their participation in the pilot project, at the same time explaining the roles and obligations expected of both parties.

The EPA will be providing the tools and processes which are to be utilized, plus a limited amount of technical guidance from EPA staff or contractors. The airport proprietors will be asked to apply these tools and processes, plus the initiative and creativity they can bring into the process, to the local development of a preferred, long-range implementation plan. A significant amount of time and effort will be required on the part of both airport and local planning agency staffs, and no special incentives can be offered by EPA beyond (1) the opportunity to the airport proprietor and local agencies of having a significant impact upon a major Federal regulation, and (2) the opportunity to get a head start on the implementation planning that would be required once the regulation is promulgated.

EPA headquarters is maintaining liaison with EPA Regional offices and with FAA's designated liaison officer for the project: Mr. Cole Morrow, FAA/EQ, (202) 426-8406.

The EPA's contractor for management of the Airports Pilot Project is Mr. Joseph D. Blatt, (202) 337-9292. A competitive procurement action has recently been completed to provide additional contractor support to assist EPA and the pilot project manager in working with the airport proprietors. To facilitate outward communication with aviation sectors whose cooperation is needed in the pilot project, Mr. Blatt has formed an "Aviation Liaison Group for the Pilot Project," with membership as follows:

- Aerospace Industries Association -- Mr. W. E. Helfrich
- Aircraft Owners and Pilots Association (AOPA) -- Mr. Charles Miller
- Air Line Pilots Association (ALPA) -- Mr. Harold Marthinsen
- Air Transport Association (ATA) -- Mr. William Becker

- American Association of Airport Executives (AAAE) -- Mr. F. Russell Hoyt
- Airport Operators Council International (AOCI) -- Mr. J. Donald Reilly
- General Aviation Manufacturers Association (GAMA) -- Mr. Stan Green
- National Association of State Aviation Officials (NASAO) -- Mr. John A. Nammack
- National Business Aircraft Association (NBAA) -- Mr. Fred B. McIntosh

Efforts are also under way to increase the amount of coordination with and input from local governments and their representative national organizations. In particular, discussions are under way with the National League of Cities/U. S. Conference of Mayors, particularly regarding the land use control facets of an airport noise regulation.

APPENDIX H

MONITORING FOR AIRPORT NOISE CONTROL

A study of the monitoring required in implementing an airport noise regulation has recently been contracted for by EPA. In the final draft of the project report, the results of that study will form this appendix. For the present draft, some background information and the objectives of the contracted study are presented.

A necessary part of the implementation of an airport noise regulation will be the monitoring of progress in controlling or reducing the impact of the noise generated by aviation activity associated with the airport.

Although a computerized noise model will be made available for the estimation of airport noise environments during the development of airport implementation plans, actual measurement of the noise environment is expected to be necessary, for two purposes: (1) to confirm actual progress in controlling or decreasing the cumulative noise exposure levels at various points on the ground, and (2) to provide a tool for controlling individual aviation-related facets of the airport's implementation plan which require cooperation by others, such as aircraft operators.

For example, approved implementation plans for individual airports may include any of the following items (this list may be amended during development and promulgation of the regulation):

(a) Approach and departure paths applicable to specific runways and, if desired, to specific parts of the 24-hour day.

(b) Noise abatement flight procedures, selected from a list of FAA-approved takeoff, approach and landing noise abatement procedures, available for use in airport implementation plans, subject to final FAA approval of the submitted plan.

(c) Single-event noise limits applicable to specific runways and, if desired, to specific parts of the 24-hour day; or, if desired, applicable to the entire airport and/or to the entire 24-hour day.

(d) Limitation or reduction of flight frequency on specific runways, during specific hours, or for the entire airport and/or the entire 24-hour day.

(e) Rules limiting the times and places, on the airport property, where engine ground runups are allowed, particularly for maintenance purposes; performance requirements for ground

runup suppressors and/or resulting airport boundary noise levels.

(f) Possible restriction on times and location for aircraft taxiing under their own power, as opposed to being towed, for aircraft producing noise levels above a specified level during ground taxi operations.

(g) Complete closure of specified runways, temporarily or permanently, either to all aircraft, or to aircraft with noise characteristics above a specified value.

(h) Construction of new runway(s) designed to place approach and departure paths over areas of compatible land use and remove them from areas of noise-sensitive land use.

Although the complete implementation plan for each airport will include land use control measures (which must be implemented by other parties and will require some form of "status monitoring"), the subject of the contracted study is limited to the monitoring of aviation-related activities and the resulting cumulative noise environment generated. It is expected that the outcome of the monitoring study may have an influence on the structure of the final regulation. At a minimum, the regulation is expected to contain a definition of the minimum legal requirement for monitoring (including a performance specification) and to require affected airport proprietors to submit their proposed monitoring programs as a part of the implementation plan they submit for FAA approval.

Since the airport noise regulation will require implementation by a wide variety of airports, a range of monitoring systems/procedures is implied. That is, a considerable expense for monitoring may be warranted at large airports generating major impact problems, but the same scale and approach to monitoring would not be appropriate to intermediate hub airports or general aviation airports (with business jet activity) generating relatively little impact. A large percentage of the airports subject to the regulation may not be required to perform noise monitoring at all, depending on their noise impact situation. Over a range of airport and impact size, the same monitoring system performance specification may be expected to result in a spectrum of actual systems, each system having differing hardware and software characteristics, personnel requirements, capital and operating costs, requirements for continuous measurement versus periodic sampling, etc. It may even be possible (and most cost-effective) for a group of small airports (e.g., in a region or a state) to share a number of portable monitors if their monitoring needs are only periodic, possibly under the auspices of their state aeronautics agency or pollution control agency.

Further, consideration must be given in the monitoring study to the possibility that a number of agencies at varius levels of government,

as well as the public, may wish to utilize the data. The FAA will be the agency ultimately responsible for overall enforcement of the airport noise regulation. However, various roles in the implementation may be played by local planning agencies, state pollution control agencies, and other Federal agencies such as EPA and HUD. Data on single flight operation events (or statistical summaries thereof) may be required for distribution to(a) airport proprietors and aircraft operators, to aid them in assessing their progress and diagnosing problems, and (b) the FAA for enforcement purposes.

This problem is slightly related to the FAA's contracted study under RFP #WA5R-4-0095, "Aircraft Noise Measurement System," dated December 6, 1973. Specifically, one section of that program is a listing and identification of all foreign and domestic airports within the free world with functional noise measurement systems, followed by a detailed technical evaluation of "the ten most complete and comprehensive noise measurement systems available today." Coordination between EPA and the FAA has led to an FAA commitment to make the results of this section of their study available to EPA as soon as completed by their contractor, estimated to be about October 1, 1974.

The contract recently intiated under EPA's auspices will be performed in two phases. The first phase calls for the development of: a comprehensive set of system evaluation criteria; a background report on the basic characteristics, mode of application and effectiveness of airport noise monitoring systems in this country and abroad; description of the several alternative monitoring approaches; and definition of measurments or field studies (if any) necessary to evaluate the several alternative monitoring approaches and associated monitoring systems. The second phase of the study will provide for: development of a data base adequate to document the evaluation of the monitoring alternatives under consideration (according to the criteria developed in the first phase); a comparison of the alternatives; identification of the most promising family of monitoring approaches; and determination of the effectiveness, costs, personnel training requirements and other factors utilized in the monitoring approaches.

APPENDIX I

REPORT ON THE LAND USE CONTROL STUDY

In the final project report this appendix will consist of the advisory document on strategies for land use control in conjunction with airport noise abatement plans under a Federal airport noise regulation. By the nature of the problem, this document must deal with all three levels of government (Federal, state, local); however, the major concentration will be in the area of the weakest link; means available to the Federal government to influence land use decisions. Further, the document must clearly separate those actions available under existing law and those which (no matter how desirable) cannot be carried out without new legislation.

A contracted study is under way to produce this document, with heavy participation by EPA staff and consultants, and with significant benefit being obtained from other EPA efforts to delineate the existing authorities in the hands of EPA and other Federal agencies to influence land use.

Under a separate contract, a "law in action" study is being performed regarding the experience of the State of California in regulating airport noise. The study places particular focus upon diagnosing local successes and failures in land use control adjacent to airports since the instigation of a state regulatory system which includes: (1) an airport land use commission in each county, (2) numerical (noise exposure) criteria for airport land use decisions, (3) requirement for a noise element in all general plans, (4) requirement that zoning decisions be consistent with general plans, and (5) requirement for an environmental impact report (EIR) on proposed actions by state or local agencies.

In a sense, the "California experience" is being looked upon as a "pilot project" from which the Federal government may learn in formulating a Federal regulation on airport noise.

The following preliminary outline of the advisory document provides an indication of its proposed content.

OUTLINE OF THE ADVISORY DOCUMENT

ON LAND USE CONTROL STRATEGY

"Compatible Land Use: Federal Interventions at the State and Local Level Which are Necessary or Useful in Preventing Levels of Aircraft Noise Exposure Potentially Injurious to the Public Health and Welfare"

I. Introduction

A. Background
- Brief review of pertinent legislation and regulations

B. Purpose
- Description of the goals and objectives of the "Advisory Document"

C. Significance
- The necessity of a comprehensive approach
- Such intervention has already occured in similar areas for related purposes

II. Urbanization and the conflicts precipitated by the concentration of economic activity

A. Benefits resulting from the concentration of "incompatible" land uses

1. Interdependence of land uses

2. Limitations of the temporal integration of dependent activities.

3. Advantages of the spatial integration of dependent activities

4. Specialization, diversity and productivity as a function of spatial and temporal integration

B. Costs associated with the concentration of "incompatible" land uses

1. Perturbations resulting from the spatial integration of dependent activities

2. Externalities: limitations of the pricing mechanism

3. Health, safety and welfare as evaluation criteria: the regulatory frame work

4. Decreased utility under regulation: the secondard pricing mechanism

C. The role of government in the prevention and amelioration of conflict resulting from "incompatible" land use.

1. Reducing perturbations associated with specific activities: the test of technological feasibility and economic responsibleness in "source control."

2. Prescribing optimal development patterns: land use control and the selective disintegration of incompatible, dependent activities.

3. Providing public compensation for economic hardship resulting from land use control: executive, legislative and judicial Interpretations.

4. Requiring private compensation for damages to persons or property resulting from incompatible activities; judicial intervention.

III. The emerging Federal role in the prevention and amelioration of conflict resulting from "incompatible" land use

A. Technological innovation and the evaluation of the effects of specific perturbations; new protection for the public health, safety and welfare.

1. Measurement tools & techniques; making monitoring and enforcement a practical reality.

2. Prediction: forecasting impacts makes preventive action reasonable and imperative.

3. Standards: acceptability criteria establish new values and objectives.

B. Regulation of specific sources and activities: the established Federal role.

1. Air quality

2. Water quality

3. Noise emissions

4. Transportation safety

5. Hazardous materials

6. Occupational safety

7. Others

C. Incentives for the development of compatible land use: the emerging Federal role.

1. VA & FHA mortgage insurance

2. A-95 agency review

3. National Environmental Policy Act

4. Comprehensive planning requirements for categorical grants

5. Others

D. Regulatory actions directly controlling local land use: the new frontier

1. FDIC Flood Plain insurance

2. Air quality

3. Airport clear zones

4. Others

IV. Airport land use compatibility as a local and regional adversary condition: problems and solutions

A. The etiology of encroachment

1. The life cycle of an airport

2. "Preventive" and "remedial" situations: the continuum of airport typologies

3. "Compatible" and "incompatible" development: the elusive evaluation criteria

B. An idealized airport land use planning and control process

1. Elimination of the constraints imposed by political fragmentation.

2. The planning function: establishment of a land use guidance system and areawide comprehensive plan for undeveloped, developing, developed and redeveloping land.

3. The control function as selective application of appropriate land use control mechanisms: acquisition, regulation, taxation, capital improvements and contractual agreement.

V. The Federal role in the abatement of aircraft noise exposure through land use control mechanisms

A. Incentives, controls and sanctions applicable at the state level

1. Authority under existing administrative discretion

2. Approaches requiring the promulgation of new regulations

3. Approaches requiring new legislation

B. Incentives, controls and sanctions applicable at the local level

1. Authority under existing administrative discretion

2. Approaches requiring the promulgation of new legislation

3. Approaches requiring new legislation

APPENDIX J

REPORT ON THE ECONOMIC/FINANCING STUDY

In the final version of the project report, this appendix will consist of the report(s) on the contracted studies on economic impact and financing, together with a summary representing the EPA/ONAC staff assimilation and integration of those studies.

The objective of these studies is to assess the domestic and international economic impacts of implementation actions resulting from alternate forms of a Federal regulation on airport noise. Since cost allocation and incidence will vary depending upon the financing mechanisms made available, the economic impact study must have embedded within it the most likely or feasible financing schemes.

To give a complete picture, the study must encompass not only the repercussions of local land-side and airport operational abatement actions, but also the actions resulting from the other aircraft regulations which are so crucial to the achievement of any specified rate of improvement in airport/community noise exposure; i.e., the retrofit and noise abatement flight procedures regulations. Fortunately, a significant amount of abatement cost-effectiveness work has already been done in those areas, which can be utilized. The major areas of new analysis are in the land-side actions and the airport operational changes; some of the latter may have domino effects outward through the entire air transportation system.

Several of the other ongoing studies in the airport regulation program will, of course, generate new cost data (e.g., the monitoring study and the airports pilot project). The administrative costs associated with various forms of a regulation must also be estimated.

Finally, these studies will include an estimate of any major energy demand effects (positive or negative).

At the date of this draft, EPA has received the results of two small (preliminary) contracted studies 1/ 2/ and is preparing to contract for the major economics/financing study itself.

References:

1. "Analysis of Methodology for the Economic Impact of Airport Noise Regulations," Arthur D. Little, Inc., April 1974. (This Phase I study develops methodology and assesses the adequacy of existing data base.)

2. "Methods of Financing Airport Noise Regulation Requirements Arising in the Airport Region," Urban Systems Research and Engineering, Inc., July 1974. (This study qualitatively evaluates alternative financing sources mechanisms, for land-side abatement actions only, with respect to efficiency, equity, ability to minimize adverse impacts, and administrative feasibility.

APPENDIX K

THE DOCKET FILE

There are presently two paths by which entries to the docket for the airport noise regulation are received:

(1) Responses to the EPA "Notice of Public Comment Period," published in the Federal Register on February 19, 1974. (The closing date for entries, for the airport regulations, was June 26, 1974.)(2) Since the end of July, 1973, all citizen noise complaint letters concerning airport noise and received at EPA headquarters are entered in the docket. (Prior to that time, they were entered in the master file for development of the EPA Report to Congress on Aircraft and Airport Noise, submitted July 1973.)

Subsequent to publication of the first draft project report, a third path for entries to the docket will exist -- the comments of reviewers of the draft project report.

All entries are seen by the Program Manager for Airport Noise regulation, before they go into the docket. After the closing date for comments in response to the February 19 Notice, a detailed analysis of the docket will be made and the results taken into consideration in development of the regulation. For the present, an indication of the number and type of docket entries being received is given in the following pages.

List I itemizes the docket entrties by originator's name and assigns a serial number to the entry. List II broadly categorizes the sources of docket entries, and List III broadly categorizes the subjects. In the matrix provided in Figure 1, the serial numbers of the docket entries are entered in the appropriate matrix location, according to general category of source and subject.

A high percentage of the entries come from either state and local governments or individual public citizens, with the split about even between the two. In general, they are supportive of regulatory action on the topics listed in the Federal Register Notice, and are urging that we get on with the job on an expedited basis. Many entries from both groups cite specific airport noise problems they are experiencing; a large fraction are connected with Chicago O'Hare Airport.

Some entries contribute original research reports or detailed technical comments and suggestions. These will be subject to further, detailed analysis for purposes of developing the regulation.

LIST I

DOCKET ENTRIES

1. City Engineer, Christchurch, England
2. Janet Gray Hayes, Vice-Mayor, City of San Jose, Calif.
3. H. K. Rowan, Cypress, Calif.
4. Roger F. Honberger, Dpty. Admin. Officer, County of San Diego, Calif.
5. Carl F. Nielson, Chrm. Noise Pollution Committee, The Conservancy Assn., Hong Kong
6. Mrs. Phyllis Kreitman, Pres., County Estates Civic Assn., East Hills, N. Y.
7. Gary L. Singleton, M. D., Washington, D.C.
8. Robert E. Veverka, Minneapolis, Minn.
9. David G. Graeven, California State University, Haywood, Calif.
10. Robert Conot, Pres. Sunset Hills Homebuilders Assoc., Thousand Oaks, Calif.
11. James F. Scearce, EPA (A-100)
12. Ms. Ethel Cameron, Squantum, Mass.
13. Joel D. Joseph, Staff Attorney, Action on Safety and Health, Washington, D.C. (2 letters: Dec. 10, 1973; and March 5, 1974)
14. Samuel W. Cohen, M.D., Brooklyn, N. Y.
15. Mrs. R. F. DeLamater, Atlanta, Ga.
16. Nigel D. Finney, R. Dixon Speas Associates, Minneapolis, Minn.
17. William C. Plentl, Jr., Director of Aviation, North Carolina Dept. of Trans.
18. Richard C. Hartuis, Park Ridge, Ill.
19. Thomas R. Fini, Clarence, N. Y.
20. G. Borgeaud, Geneva Airport Authority, Geneva, Switzerland
21. George W. Kamperman, P.E., Kamperman Associates, Downers Grove, Ill.
22. J. C. Holman, Oak Park, Ill.
23. Mrs. Roger Geske, Ithasca, Ill.
24. Albert H. Castle, Chicago, Ill.
25. P. Patrick Mann, Environmental Standard Supervisor, Inglewood, Calif.
26. Edward K. Patten, Mayor, Glenview, Ill.
27. Richard H. Plant, Prospect, Ill.
28. Mr. & Mrs. Wm. Robey, Bensonville, Ill.
29. John W. Braun, Chicago, Ill.
30. John Baker, Palm Springs, Calif.
31. Mrs. R. Holst, Park Ridge, Ill.
32. Phillip Landahl, P.E., O'Hare Area N.O.I.S.E. Chapter
33. Herbert H. Behrel, Mayor, Des Plaines, Ill.
34. C. W. Evans, The British Society of Aerospace Companies, Ltd., London
35. Walter Rittmueller, Principal, St. Paul Lutheran Church and Christian Day School, Chicago, Ill.