DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

FAR Part 36 Compliance Regulation

FINAL ENVIRONMENTAL IMPACT STATEMENT

Pursuant to Section 102(2)(C), P.L. 91-190

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FINAL ENVIRONMENTAL IMPACT STATEMENT

Pursuant to Section 102(2)(C), P.L. 91-190

CONCUR: Judith T. Connor — 11/10/76

Assistant Secretary for Environment, Safety and Consumer Affairs, TES-1 — Date

APPROVAL: Charles R. Foster — 11/10/76

Director, Office of Environmental Quality, AEQ-1 — Date

SUMMARY

(Check One) ( ) Draft (✓) Final Environmental Statement

Department of Transportation, Federal Aviation Administration

1. FAR Part 36 Compliance Regulation (Check One)
   (✓) Administrative Action ( ) Legislative Action

2. The action is an amendment of the Federal Aviation Regulations, FAR Part 36 extending noise standards to civil subsonic turbojet airplanes with maximum takeoff gross weight of 75,000 pounds or more, operating into United States airports.

3. The regulation will provide substantial noise relief to persons throughout the United States living near airports accommodating the aircraft subject to the amended rule. Minor increases in fuel consumption and air pollution from aircraft emissions may result from compliance with the noise standards.

4. The following categories of alternatives were considered:

   A. No action and deferred action.

   B. Noise reduction solely through operational procedures.

   C. Less stringent standards than proposed in NPRM

      - higher noise levels
      - allow tradeoffs and/or compliance with ICAO Annex 16
      - exempt international operations
      - modify JT3D aircraft only

   D. More stringent standards

      - establish more stringent standards than proposed, implying refan (or reengine) for all non-Part 36 aircraft

5. Comments have been requested from:

Environmental Protection Agency
- Office of Federal Activities

Federal Energy Administration

Office of Management and Budget

Civil Aeronautics Board

Department of Commerce
- National Bureau of Standards

Department of Health, Education, and Welfare

Department of Housing and Urban Development

Department of the Interior
- Bureau of Outdoor Recreation
- Bureau of Sport Fisheries and Wildlife
- National Park Service

National Aeronautics and Space Administration

Department of State

United States House of Representatives
- Appropriations Committee
- Committee on Science and Astronautics, Subcommittee on Aeronautics and Space Technology

United States Senate
- Appropriations Committee
- Commerce Committee, Aviation Subcommittee
- Public Committee

State Aviation Agencies

City of Inglewood, California, Office of the Mayor

City of Burbank, California, Office of the Mayor

City of Santa Maria, California, Office of City Administrator

Village of Lawrence

Incorporated Village of New Hyde Park

Village of Cedarhurst

6. The final statement was filed with the Council on Environmental Quality and made available to the public on November 17, 1976. The draft statement was circulated for comment on December 6, 1974.

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FINAL ENVIRONMENTAL IMPACT STATEMENT

I. INTRODUCTION: THE FEDERAL ACTION

The Federal Aviation Administration issued (1) two Notices of Proposed Rule Making (NPRM) entitled "Civil Airplane Fleet Noise Requirements," and "Civil Subsonic Turbojet Engine Powered Airplanes: Noise Retrofit Requirements." The latter was submitted to the FAA by the Environmental Protection Agency (EPA) pursuant to the provisions of the Noise Control Act of 1972. (Both NPRM's are in Appendix A.) These proposed regulations would require U.S. civil subsonic turbojet engine-powered airplanes to meet the noise requirements of FAR Part 36. The first NPRM was applicable to airplanes with maximum weights of 75,000 pounds or more, while the second NPRM had no such limit. The only significant difference between the two NPRMs is that the EPA proposal regulation would extend to business jets. In addition, both proposed regulations require operators of these aircraft to show that they are progressing toward compliance with these standards in a phased program.

It is not the purpose of this EIS to describe the regulatory action being taken in detail or respond to all comments on the regulatory proposal. This impact statement considers the consequences of the final rule which requires civil subsonic turbojet aircraft over 75,000 pounds maximum weight to comply with FAA Regulation Part 36 noise requirements under a schedule beginning January 1, 1977, and ending December 31, 1984. The final rule will consider, with more specificity comments received in the docket, public hearings, and interagency review.

In extending the FAR Part 36 noise standards to aircraft which received airworthiness certificates prior to applicability of FAR Part 36, the FAA is acting pursuant to the Federal Aviation Act of 1958, as amended by the Noise Control Act of 1972. By that Act, the Congress directed the FAA to afford present and future relief and protection to the public health and welfare by the control and abatement of aircraft noise with the requirement that any standards or regulations must be consistent with the highest degree of safety in air commerce and must be economically reasonable, technologically practicable, and appropriate for the particular type of aircraft. This amendment to the Federal Aviation Regulations is the result of a number of years of study of these factors by the FAA and consultation by the FAA with the EPA and the Secretary of Transportation which balances the considerations of public welfare, safety, economic reasonableness, and technological practicability.

Under the requirements of the Noise Control Act of 1972 (18), and previous legislation, the FAA and other Federal agencies have been developing a comprehensive program to reduce public exposure to aircraft noise. In addition to FAA-sponsored research in reduction of turbomachinery noise through the use of sound absorbing materials (SAM), NASA has conducted a parallel program which included SAM, but also focuses on reduction of JT8D jet exhaust noise by redesign of the engine itself by increasing the engine bypass ratio through replacement of the two-stage fan with a larger diameter single-stage fan (refan). Complementing these programs in source noise reduction, FAA and NASA have also been examining the use of operational procedures for further reductions in noise.

Aircraft noise is a significant annoyance for six to seven million Americans. The problem is particularly serious at some of the major airports, such as those in New York, Los Angeles, Boston, Atlanta and Chicago. It represents, moreover, a significant or potential problem for residents living near many other airports across the nation, and as air travel increases, noise will become a serious problem at some of these other airports as well. Aircraft noise is a problem of national scope because a significant portion of the American people are affected by it at many locations throughout the country. For example, the 1973 Annual Housing Survey conducted by the Bureau of the Census for the Department of Housing and Urban Development, indicated that of those surveyed, 20.2% experienced noise from airplane activity in the vicinity of their home. Of those experiencing noise - 34.2% considered the noise to be disturbing, harmful or dangerous; 6.3% felt airplane noise to be so objectionable that the household would like to move from the neighborhood. Airplane noise is also a peculiarly local problem, varying substantially among airport communities depending on the air service provided, the type and frequency of operations, the airport design and geographical arrangement, the mix of equipment and route patterns, the numbers of people who live nearby and their reaction to aircraft noise, and the general compatibility of land use in the surrounding areas.

The aircraft noise issue became increasingly important in the early 1960s as airlines introduced jet aircraft to their fleets. The rapidly increasing number of commercial jet operations in the latter part of the decade further increased the importance of this problem. Because of its adverse effect on people, noise was soon recognized as a major constraint on the further development of commercial aviation, and action was taken to address it. The engine manufacturers and the Federal Government both engaged in extensive research into quieting jet engines. In 1968, Congress gave the FAA the responsibility to regulate aircraft design and equipment for noise reduction purposes, and the FAA then embarked upon a long-term program of controlling aircraft noise at its source. FAR 36 set standards for turbojet aircraft of new design in 1969. A 1973 amendment extended the same standard to all new aircraft of older design. A third major milestone in the source noise control program is this one, in which the previously built subsonic air carrier aircraft must be brought into compliance with the noise limits of FAR Part 36 or be retired from service in the U.S. by the established compliance dates. (See Appendix I for regulation summary.)

Compliance deadlines for each aircraft type have been established on the basis of what is technologically practicable and economically reasonable. See Appendix D for the analysis of the cost and benefit of the regulation.

The United States will work through the International Civil Aviation Organization (ICAO) to reach agreement with other nations on a program to abate aircraft noise. If agreement is not reached, action will be taken to require that aircraft flown by carriers of other countries meet FAR Part 36 noise levels at a future specified date which is expected to be consistent with the requirements established for U.S. flag carriers.

The current U.S. fleet is comprised of some 2100 large jet aircraft. Of these, 1600 (about three-fourths) do not comply with FAR Part 36 noise standards. It has been estimated by various sources (2, 3, 4, 5) that between 1,300 and 1,600 of these noncomplying aircraft would remain in service throughout the 1970s and possibly some 50% would be in service by 1990 if there was no federal action. Appendix B contains a detailed listing of the existing fleet and fleet forecasts developed by the FAA. These data were used in the environmental and inflationary impact analyses supporting this rule making. While the cost and benefit analysis (Appendix D) indicates that prolonged retention of the B-707 and DC-8 fleet would be uneconomical due to increased maintenance and higher fuel cost differentials, the replacement policy of individual operators will depend on their capital investment plans and financial capability.

noise levels so that modifications can readily be made to the previously produced aircraft. British Aircraft Corporation, in conjunction with Rolls Royce Limited (1971), has evaluated results for an acoustic modification for the Rolls Royce SPEY engine powering the BAC-111 airplane (12).

The FAR Part 36 noise standards are shown graphically in Figures I-1, I-2, and I-3 (13, 14) along with the corresponding values for jet airplanes in current use. It can be seen that reductions in noise level at the FAR Part 36 measuring points ranging up to 14 EPNdB will be achieved for a number of air carrier transport types through compliance with FAR Part 36 noise levels. (See Section II for a description of the measuring point geometry.)

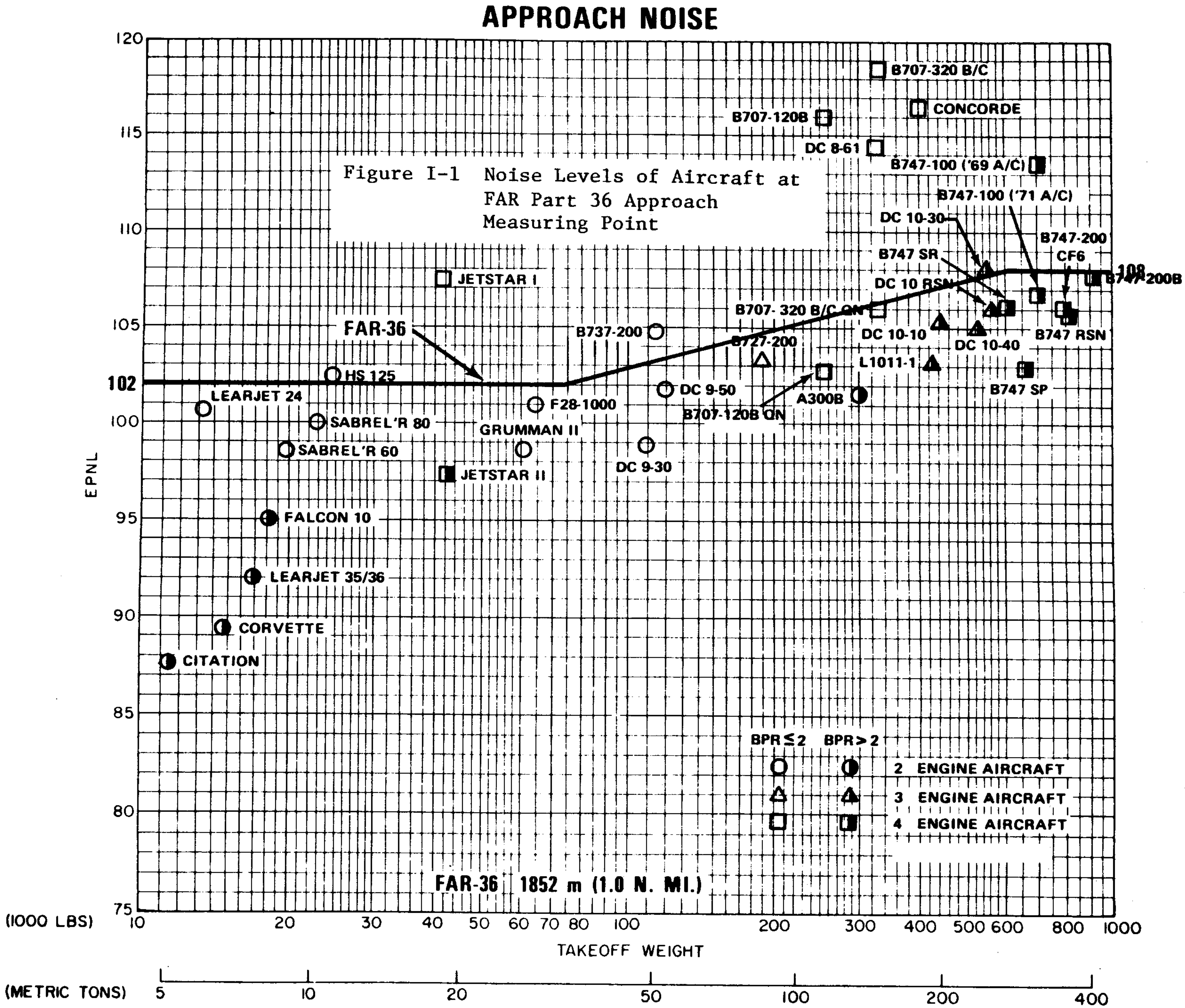
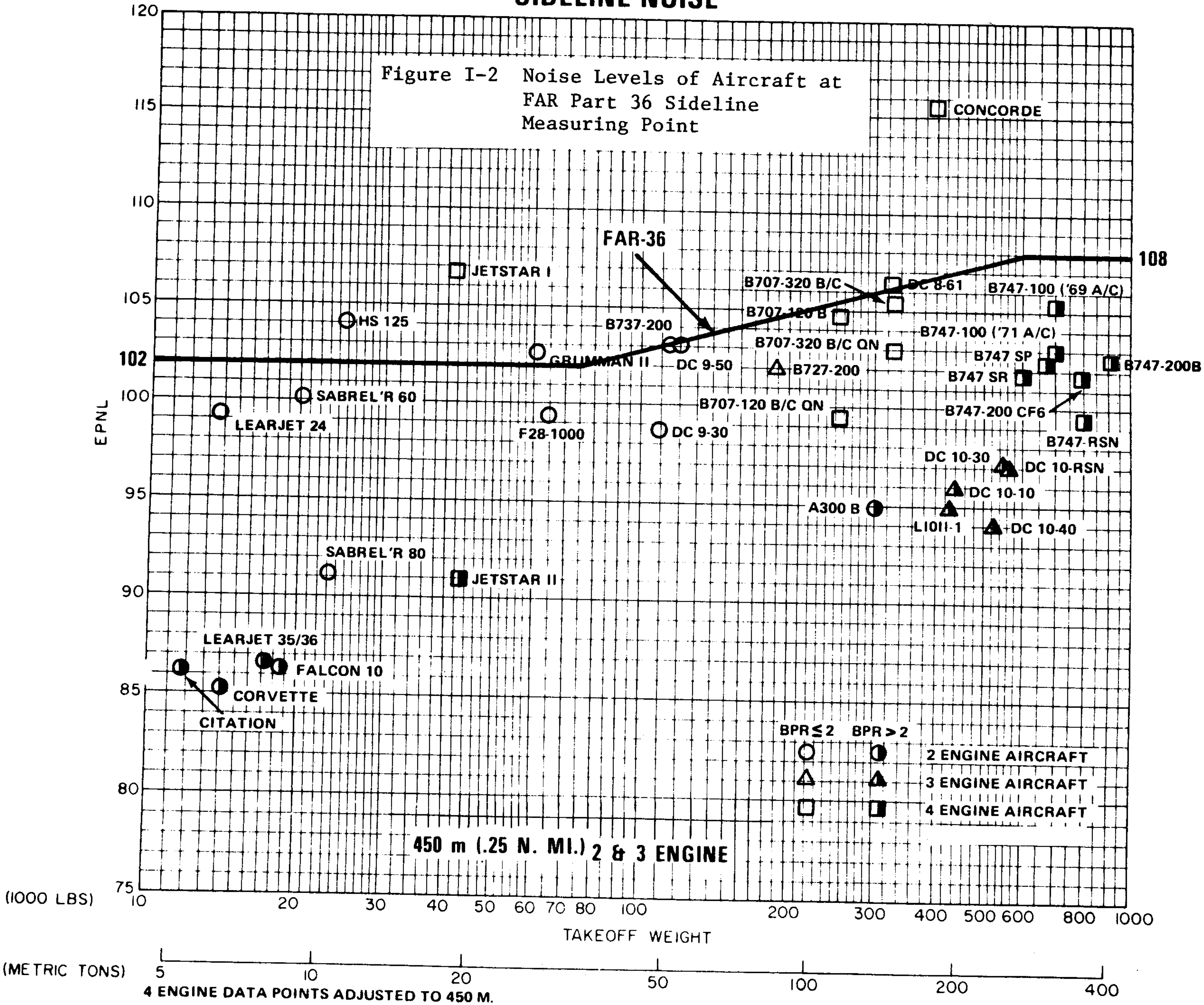
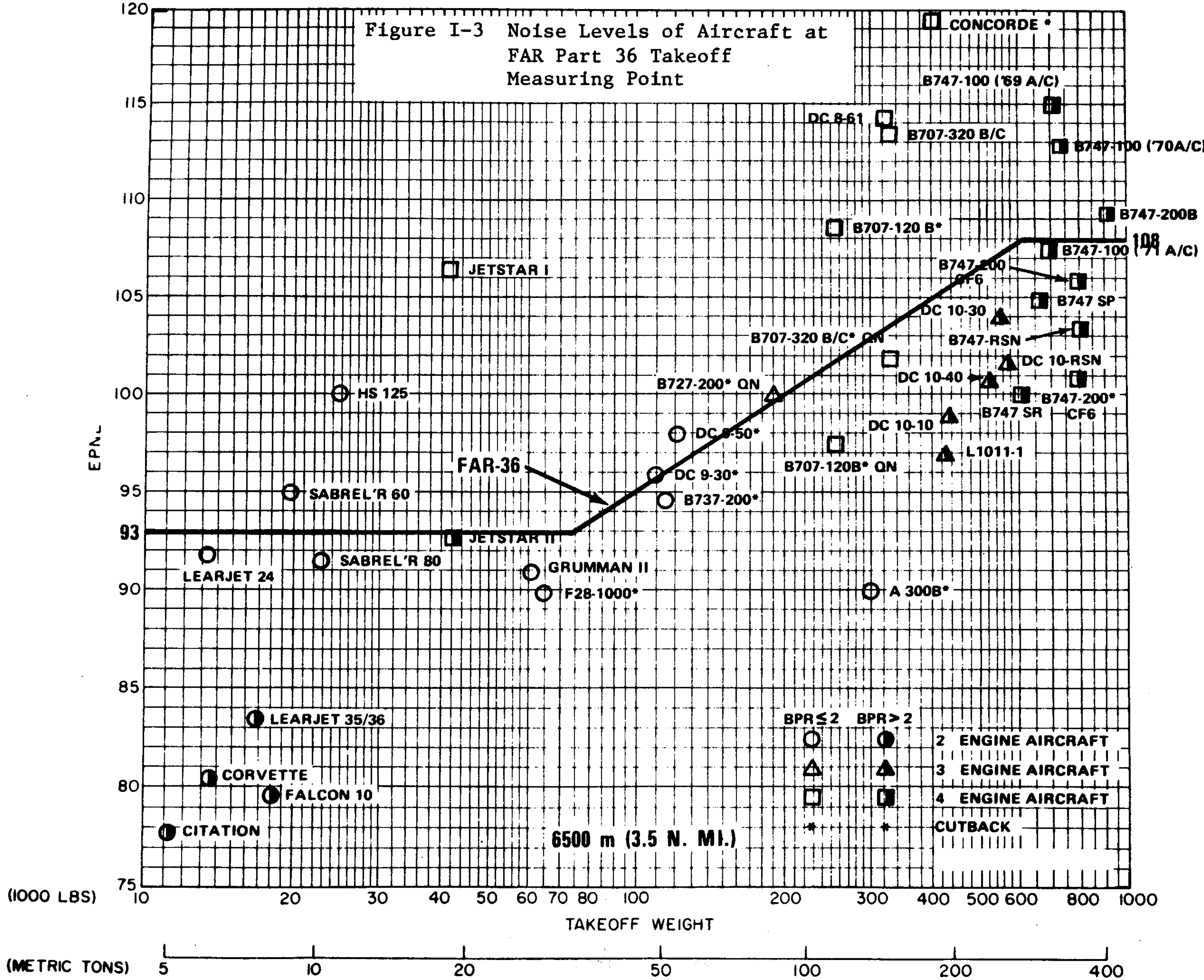


Figure I-1 Noise Levels of Aircraft at FAR Part 36 Approach Measuring Point

SIDELINE NOISE



TAKEOFF NOISE



II. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

In this section, an examination is made of the expected environmental benefits to be achieved from implementation of the final rule prescribing operating noise limits that apply within the United States to the landing and takeoff of civil subsonic turbojet-powered airplanes operating under FAR Parts 91, 121, 123, and 135, and that have maximum certificated takeoff weights of 75,000 pounds or more. In addition, possible negative effects on other aspects of the environment are addressed.

NOISE BENEFITS

Before the FAA issued the NPRM's (1), the technological alternative of modification was examined thoroughly. The FAA determined that the SAM nacelle treatment would provide meaningful relief, that is, it would result in a reduction in airplane noise levels which would significantly reduce annoyance levels for persons living near airports.

The absolute magnitude of the reduction in effective perceived noise decibels (EPNdB) for the various effected aircraft is shown in Table II-1. This shows improvements ranging from some 13 EPNdB for JT3D powered aircraft, 4-6 EPNdB for JT8D powered aircraft, and 3 EPNdB for JT9D powered aircraft. Discussions of the effects of reductions of noise on people are contained in Appendix F.

The FAR Part 36 measuring points are locations from which the noise of a particular aircraft is measured during certification. They result in noise level measurements of an aircraft at 1 nautical mile from the

TABLE II-1

NOISE LEVELS UNDER FAR 36 CERTIFICATION CONDITIONS (EPNdB)

Aircraft	Condition	FAR 36 Limit	Unmodified	Fully Modified
707-320B	Takeoff	103.7	113.0	102.2
	Approach	106.3	116.8	104.0
	Sideline	106.3	102.1	99.0
DC-8-61	Takeoff	103.5	114.0	103.5
	Approach	106.2	115.0	106.0
	Sideline	106.2	103.0	99.0
727-200	Takeoff	99.0	101.2	97.5
	Approach	104.4	108.2	102.6
	Sideline	104.4	100.4	99.9
737-200	Takeoff	95.8	92.0	92.0
	Approach	103.1	109.0	102.2
	Sideline	103.1	103.0	103.0
DC-9	Takeoff	96.	96.	95.0
	Approach	103.2	107.0	99.1
	Sideline	103.2	102.0	101.0
747-100	Takeoff	108.0	115.0	107.0
	Approach	108.0	113.6	107.0
	Sideline	108.0	101.9	99.0

runway threshold under the approach path, 3.5 n. mi. from takeoff roll under the takeoff path, and .35 n. mi. (4-engine) or .25 n. mi. (2- and 3-engine) to the side of the runway at the point of maximum noise during takeoff. Although the FAR Part 36 figures do not provide projections of total noise impact at an airport, they do provide a standardized method of measuring aircraft noise for certification purposes and are very useful in indicating the comparative noise levels of individual aircraft. (See Appendix E, noise footprints.)

It should be noted that not all aircraft will achieve equal reductions using the SAM modification packages. Some will benefit more than others, due to differing aircraft power curves, installation, and operational characteristics. Additionally, the sound level reductions at all three measuring points (takeoff, sideline, and approach) will not be equal, as can be seen from the Table. However, it should be noted that in optimizing the engine modification materials and installation, many aircraft will be able to achieve levels at some measurement points which are below the requirements of FAR Part 36.

In a letter to the FAA, referencing the above reductions in noise levels, members of the Committee on Hearing and Bioacoustics of the National Research Council of the National Academy of Sciences and the National Academy of Engineering stated:

"We believe that the above reductions in aircraft noise level represent significant and beneficial improvements, which will provide meaningful and perceivable relief to airport neighbors. Recent research had indicated clearly that aircraft noise reductions on the order of 6 EPNdB are quite apparent to residents near airports and result in substantially less annoyance to those residents."

In its project report (20) dealing with recommended noise standards for civil subsonic turbojet airplanes, The Environmental Protection Agency states that nacelles treated with SAM would result in a meaningful reduction in airport community noise exposure. The benefits were predominantly attributed to approach operations for JT8D aircraft and for both takeoff and approach operations for JT3D aircraft.

A NASA sponsored study conducted by Professor Paul N. Borsky (15) of the Columbia University's School of Public Health, College of Physicians and Surgeons, demonstrated that there was a 50 percent reduction in the number of test subjects who had expressed highest annoyance of the standard B-727 aircraft as compared to the SAM acoustically treated B-727. This reduction was perceived in laboratory tests using test subjects who live in the Kennedy International Airport environment and was achieved with a difference of 6 EPNdB between the two aircraft. An additional psychoacoustic study (16) conducted by NASA using DC-8 noise characteristics has shown that sleeping test subjects have a markedly lower degree of wakefulness when exposed to the noise spectra which would be produced by an acoustically treated DC-8 as compared to spectra from an untreated aircraft.

Noise measurements taken by the Port Authority of New York and New Jersey during routine airline operations at airports in the New York City area, showed that B-727-200 aircraft which were produced to meet FAR Part 36 were, on the average, during approach, 6.5 PNdB lower than the B-727-200 aircraft which were not produced meeting FAR Part 36. The value relates to a point about 1 mile before landing.

A joint FAA-Boeing Company project, which culminated in May 1973 flyover demonstrations for members of Congress and the public at Dulles International Airport, proved that takeoff noise reductions of 11 EPNdB and approach noise reductions of 15 EPNdB were achievable using nacelles quieted with sound absorbing material on a JT3D powered B-707 aircraft and, that the noise reduction was highly significant and clearly perceivable.

A final indication of the benefit of the FAR Part 36 limits are established by the relative improvement resulting from the introduction of new widebody aircraft which comply with FAR Part 36. Letters to the docket in response to the NPRM, letters to Congress and the FAA, and public sessions with airport neighbors have provided a limited sample of public opinion which shows that the new widebody jets are more acceptable than the older jets not only because the noise levels are lower but the total spectra content, particularly on approach, is not as annoying.

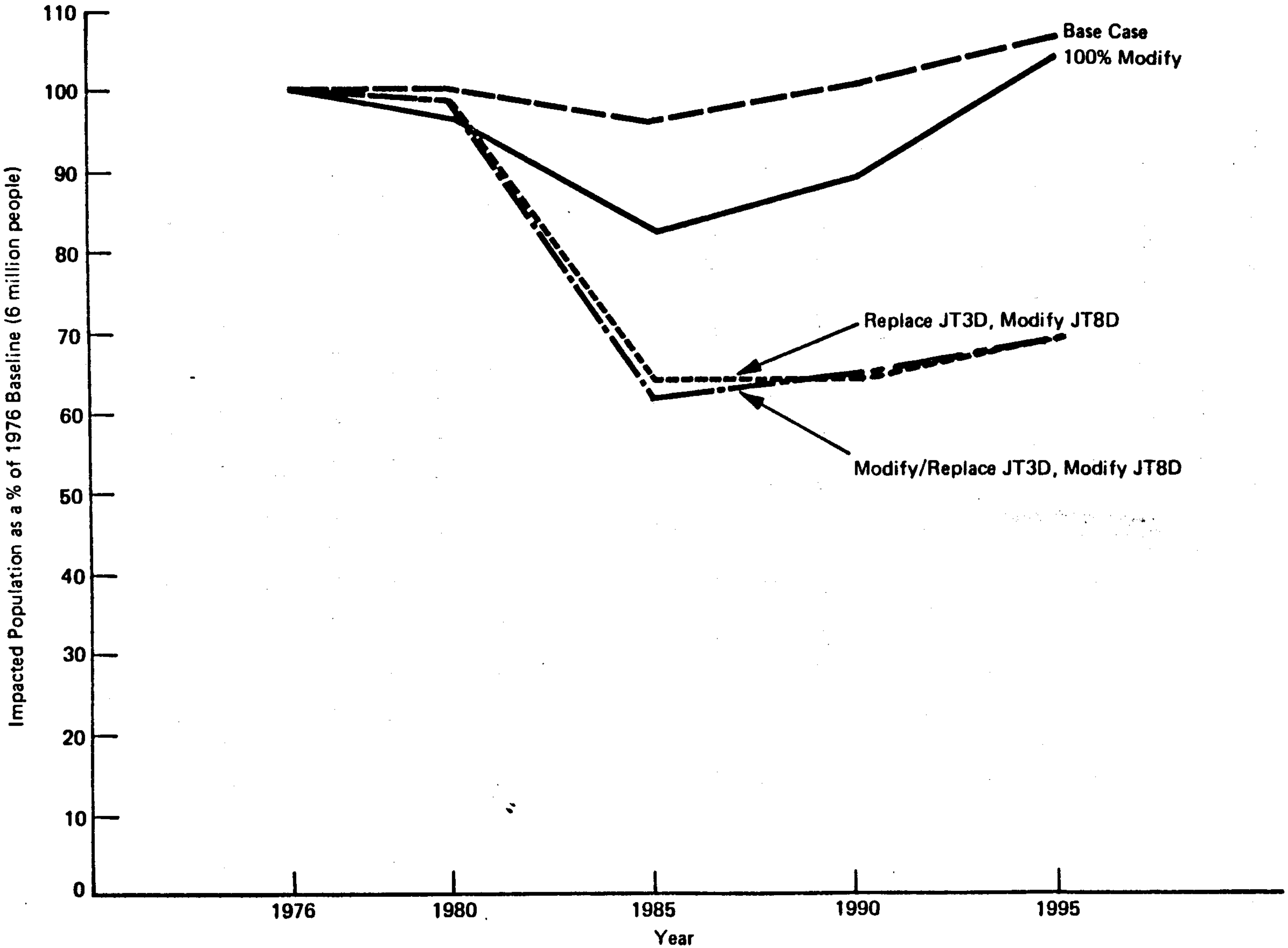
Table II-1 reflects the noise benefits expected from representative aircraft based upon noise intensity at specific points. A measured (or computed) noise level varies with the distance of the aircraft from the point at which the sound is observed. When the variations of noise with distance are combined with knowledge of other attenuation effects, a projection of lines of equal noise level can be prepared and displayed as "noise footprints." Such noise footprints have been prepared at various noise levels for aircraft with and without quiet nacelles. Examples are shown in Appendix E which indicate the degree of reduction in areas of noise impact achievable through compliance.

The previous discussion has dealt with the benefits associated with single events, individual aircraft takeoffs/departures and landings. The Department of Transportation completed an extensive study in which it viewed the noise impact that these events would have at each of 23 major airports, the impact at the aggregate of these 23 airports, and the impact at a representative airport (derived from the 23 airports). The data from the 23 Airport Study have been used by the FAA to model the effect of compliance and other noise abatement alternatives on a national basis.

The FAA currently estimates that there are 6 million people residing on 1500 square miles exposed to cumulative noise levels of NEF 30 or higher and 1/2 million people residing on 150 square miles exposed to

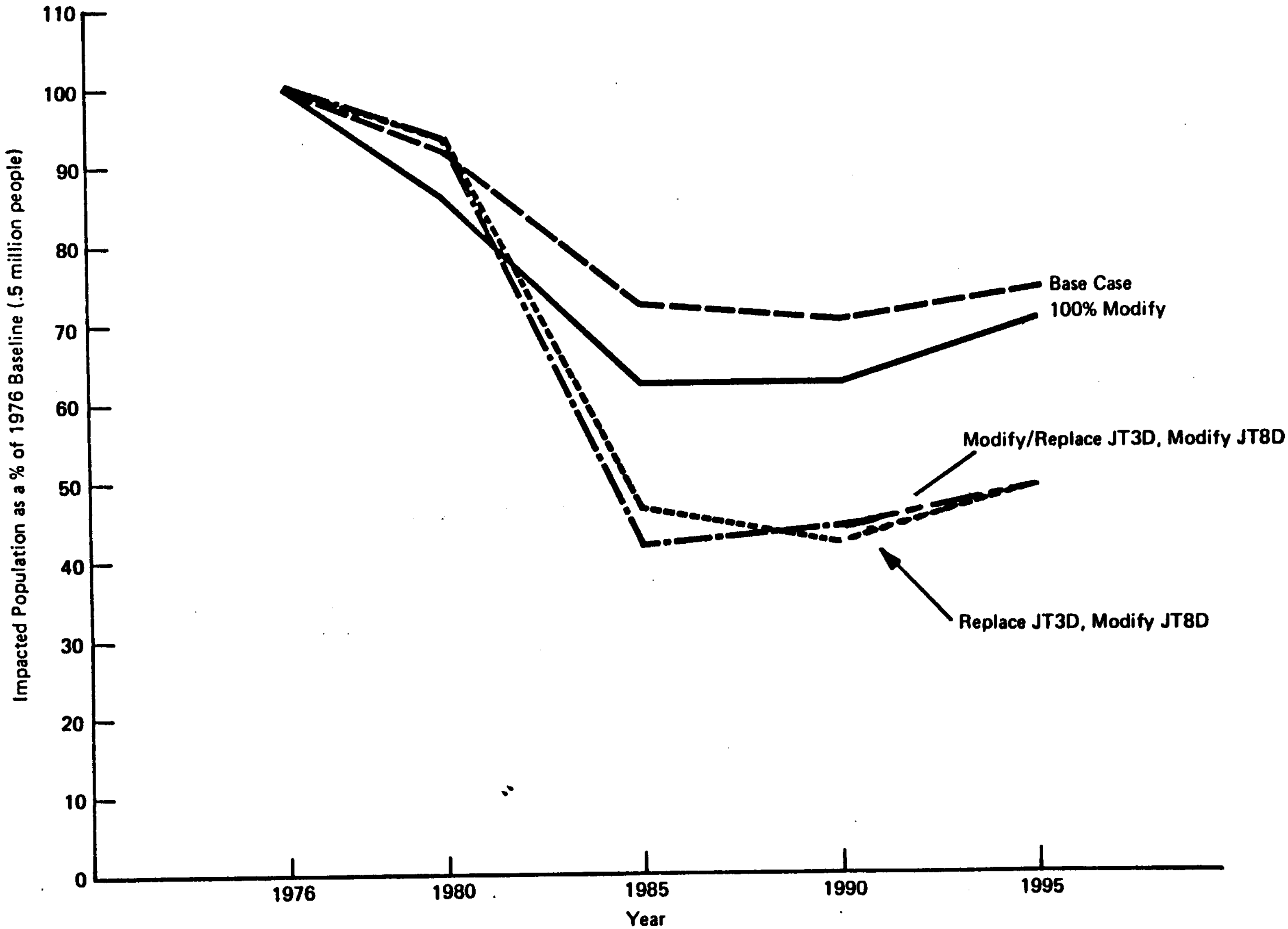
NEF 40 or higher. Compliance with the regulation can, by 1985, shrink the NEF 30 contours away from some 2.5 million people in the U.S. providing that replacement of JT3D powered aircraft is extensive. About .25 million people, or half of those presently within NEF 40 contours, will similarly benefit by shrinkage of the NEF 40 contours. These environmental benefits will being prior to 1985 and continue for many years thereafter. Figures II-1 and II-2 indicate the FAA projections of the percentage reduction in the size of noise impacted population around all U.S. airports as a result the major alternatives considered in the benefit and cost analysis. These alternatives cover the range of possible industry response to the regulation. Discussions of the meaningfulness of NEF values are found in Appendix F. NEF 30 annoyance response is cited as 38% of the population annoyed and 27% seriously annoyed; for NEF 40, the seriously annoyed population is 69%.

The NEF procedure has been developed over the last decade for land-use planning around airports as the number of jet aircraft has increased and their noise has become more of an annoyance. NEF is a cumulative noise exposure descriptor which is meaningful in measuring the overall impact that residents around busy airports might experience from the mix of equipment and time of day and frequency of flights serving a particular airport. The Environmental Protection Agency has



RELATIVE EFFECTIVENESS – IMPACTED POPULATION
(NEF 30)

FIGURE II-1



RELATIVE EFFECTIVENESS — IMPACTED POPULATION
(NEF 40)
FIGURE II-2

recommended use of a cumulative noise exposure expressed by a measure called Day/Night Noise Level (Ldn). Equivalent NEF values can be expressed approximately as:

NEF 30 = Ldn 65; NEF 40 = Ldn 75

A decrease of one NEF unit is equivalent to a reduction of 2 percent in the number of people highly annoyed and is equal to a reduction of about 14 percent in the area exposed. (See Appendix F for a more detailed discussion of noise effects.)

The relationship between NEF reduction and land area reduction is logarithmic, so that a 50 percent reduction in land area is approximately equivalent to a 4.5 NEF unit reduction, while a 25 percent reduction in land area is approximately equal to a 2.0 NEF unit reduction. While small differences in single event noise exposure are sometimes not noticable, frequent repetition of the noise can result in substantial NEF changes.

There are two basically different groups of aircraft which exceed the FAR Part 36 noise limits--the four-engine Boeing 707 and McDonnell Douglas DC-8 transports, powered with Pratt and Whitney JT3D engines, and the two- and three-engine Boeing 727 and 737 and McDonnell Douglas DC-9 transports, produced before December 1, 1973, powered with Pratt and Whitney JT8D engines. As of December 31, 1975, the U.S. fleet contained 508 aircraft in the first group and 1078 in the latter group. The regulation affects both groups. However, for purposes of this study, the JT8D equipped aircraft are assumed to receive the same degree of modification in all cases analyzed while the JT3D aircraft are alternatively viewed as modified, modified and replaced in combination, and completely replaced. (The baseline case shown in Figures II-1 and II-2, of course assumes that neither JT3D or JT8D aircraft are given any acoustic treatment not already required by FAR Part 36.)

Forecasts of fleet structure show that without this rule more than 60% of the B-707 and DC-8 aircraft would be continued in operation through 1985 in regular airline service and perhaps indefinitely in other domestic uses after 1985.

Replacement aircraft available today are the B-727-200, B-747, DC-10 and L-1011. With respect to future needs, aircraft manufacturers are now considering two types of new "low-noise" aircraft for production. These include: new technology aircraft such as the Boeing 7X7 and new technology/derivative aircraft such as the Douglas DC-X-200 designed to meet the stricter noise standards currently being proposed for modification to FAR Part 36. Upon receipt of orders, it is estimated that production could be started on these aircraft within four years.

Insofar as future fleet composition is concerned, a particular replacement program has been forecast, based on air carrier indications of their plans for updating their fleets, assuming that the government were to take no action with regard to noise reduction requirements for aircraft which do not now meet FAR Part 36. In the base case the B-707/DC-8 aircraft remain in the fleet with normal attrition and without acoustical modification. The forecast is based on industry data through 1984, and trend extrapolation beyond that time. From a technical standpoint, the B-707/DC-8 life can be extended as required, but from an economic standpoint the increased cost that occurs in conjunction with maintaining older aircraft may be a significant force for airlines to achieve some faster attrition rate than indicated by a trend extrapolation. This factor, however, is difficult to define with any degree of certainty since the attrition rate is also dependent on capital investment capability to finance the acquisition of new aircraft.

Figures II-1 and II-2 consider actions that represent various possible airline management decisions to modify and/or replace B-707 and DC-8 aircraft in their fleets. The possible alternatives range from 100% modification to 100% replacement. The JT8D aircraft are assumed to be modified rather than replaced because they have a longer remaining useful life. The most likely alternative for the JT3D aircraft depends on individual airline management decisions. In order to cover the likely possibilities, therefore, three alternative modification/replacement scenarios have been selected as presented in Figures II-1 and II-2):

Base Case - No regulation

Case 1 - The modification of 100% of the JT3D and JT8D powered noncomplying aircraft;

Case 2 - A combination of modification and replacement: modify 100 B-707/DC-8 aircraft and replace the remainder with new technology aircraft; and modify all noncomplying JT8D aircraft; and

Case 3 - 100% replacement of the B-707/DC-8 fleet with new technology aircraft, modify all noncomplying JT8D aircraft.

The analysis on which Figures II-1 and II-2 are based incorporates a detailed breakdown of projected aircraft modification/replacement as a function of future years. The schedule for the alternatives considered is included in Appendix B.

FUEL CONSIDERATIONS

As part of their respective noise suppression programs the manufacturers have performed extensive engine performance tests including the study of effects upon SFC (Specific Fuel Consumption). Indications from both Boeing and McDonnell Douglas are that at most, "negligible" fuel consumption increases would result from modifications required to meet FAR Part 36 noise standards (21, 22, 23). Conservative estimates for the B-707-120B, B-707-320B/C and B-720B aircraft range from 1.4% to 2.5% increase in in-flight fuel consumption due to engine modification.

In the case of the B-727-200, ground and flight test results indicated a penalty of .48% increased SFC relative to an unmodified B-727-200 (22). However, the expected new technology aircraft (7X7) has been assumed to provide a 30% savings in fuel consumption in comparison to the consumption of a B-707-300.

Using these estimates in conjunction with data on aircraft fuel usage (lbs/hr) by aircraft type (24), projections for changes in overall fuel consumption were determined for each of the alternatives. The following presents the approximate relative change in total fuel usage per flight hour per aircraft due to each of the three cases over the years 1976 to 1995:

Case	Change in Fleet Fuel Consumption from BASE CASE
All modify	Increase less than 1%
Replace/Modify JT3D, Modify JT8D	Decrease of 3%
Replace JT3D, Modify JT8D	Decrease of 4%

The worst of the three alternatives results in an insignificant deterimental effect upon aircraft fuel consumption. Two cases show a probable benefit in terms of fuel consumption.

EMISSION CONSIDERATIONS

Since the modifications to meet noise levels do not involve changes to the engine combustion chambers, no fundamental changes in the pollutant production process is expected. No changes in thrust are anticipated during idle and taxi, so pollution emissions from modified aircraft are expected to be unchanged during ground operations, the phase of activity that is most critical to the airport impact on air quality. During the in-flight phase of operation, changes in emissions of modified aircraft are expected to be proportional to changes in fuel consumption.

Absent compliance with existing EPA aircraft emission standards (17), new technology aircraft are expected to have greater oxides of nitrogen emissions than older aircraft, since their propulsions systems will operate at higher peak combustor temperatures. Based on the forecasts presented in Appendix B, however, fleet emission increases (considering the DC-10, L-1011, B-707, DC-8, B-720, B-727 and new technology aircraft as a group, and summing from 1976-1995) are only of the order of 1 or 2%. On the other hand, decreases of the same magnitude would be expected for that group's carbon monoxide and hydrocarbon emissions, owing to the better combustion efficiency of the new technology engines.

The above considerations of fuel use and emissions are based on an assumed "static" regulatory environment. However, currently existing EPA emission standards (17) are expected to require reduced emissions for all newly manufactured aircraft engines after 1979. The changes to fleet emissions which will accrue as a result of compliance with EPA emission standards will far overshadow the minor effects of any of the modification/replacement programs considered herein; the same is likely to be true for effects on fleet fuel consumption.

III. ALTERNATIVES

A number of alternatives were considered by the FAA. Among the comments received in response to the NPRM have been suggestions for alternate approaches ranging from no action on source noise reduction to more stringent noise level standards. The alternatives considered are in the following four categories:

(1) No action or defer action.

(2) No aircraft modification - noise reduction solely through operational procedures.

(3) Modification, but with less stringent standards than proposed in the NPRM.

- higher noise levels
- allow tradeoffs and/or compliance with ICAO Annex 16
- exemption for international operations
- retrofit of JT3D aircraft only

(4) More stringent standards

- establish more stringent standards than proposed.

1. No Action or Defer Action

One of the arguments advanced for preserving the status quo of JT3D engine source noise was the concept that natural changes in fleet mix (i.e., replacement of older design aircraft with quiet wide-body jets) would eventually provide noise relief equal to that to be obtained through modification. Figures II-1 and II-2 (Base Case and 100% modification) show the FAA projection of this phenomenon. The significance is not that eventually no-action impact converges with the 100% modification case, but rather it is the noise improvement to be enjoyed by millions of citizens over many years as a result of regulatory action now. It must be noted that the other likely possibilities in the range of alternatives projected as a result of the regulation result in much greater noise benefits. Early replacement produces such large and early benefits that convergence with no-action would not occur until long after 1995.

The significance of the benefits of the regulation have been discussed previously. The regulation compliance dates are predicated on technical feasibility and reasonable costs of compliance considering the benefits. (See Appendix D for discussions of costs and benefits of the regulation.) There is no reason to delay or not to act under these circumstances.

2. No Modification - Use Operational or Other Procedures

Under this alternative the operational procedures considered are those that are employed in the aircraft cockpit to reduce noise on the ground during takeoff, departure, and approach. These alternatives do not include preferential runway and routing for noise abatement practiced by personnel responsible for airspace management on the ground. It should be noted that while operational procedures, where feasible, can be used to augment the benefits of the regulation, they do not in themselves provide sufficient noise relief to cease efforts to reduce the impact of aircraft noise at its source. Operational techniques are being considered by the FAA as subjects of separate regulatory efforts as appropriate, but they are not considered by FAA as alternatives which substitute adequately for source noise reduction regulations.

Current turbojets are capable of operating within safe, but relatively narrow ranges of airspeed, deck angle and flap configurations during the departure phase of flight. These ranges and the attendant aircraft noise impacts are dependent upon factors such as aircraft takeoff gross weight, outside air temperature, humidity, airport elevation, wind direction and velocity, condition of engines, and pilot technique. Today, turbojet aircraft on takeoff climb rapidly to 1,500 feet. FAA Advisory Circular 91-39 recommends power cutback procedures after this rapid climb. Use of a power cutback procedure provides noise benefits, but the extent of the cutback with the attendant increase in noise benefits is limited by insuring that all safety problems posed by routine reduction in power at low altitude are eliminated.

Flap management and interception of the final approach slope at higher altitudes are two approach techniques which currently reduce aircraft noise in the approach zones. A combination of these techniques keeps the aircraft higher (from about 3 miles and beyond from the airport) and permits the aircraft to approach at a lower thrust setting. The basic physical principle being applied through this concept is to increase the separation of the listener from the aircraft thereby reducing the noise impact which when combined with reduced power cause the noise levels on the ground to be diminished. The FAA plans to take final action on these matters by January 1977.

Another technique which has been investigated places the aircraft higher and reduces the power requirements by the initial utilization of a higher descent angle for the aircraft to a point on its approach path where it intersects the normal glide slope. This technique often is commonly referred to as a two-segment approach. This approach also provides potential benefits but at significant distances (beyond 3 miles) from the airport.

There is considerable concern over the safety aspects of the two-segment approach relating to aircraft performance and the effects of wind shears, winds, and icing. Of particular concern is the increased probability of encountering wake turbulence.

In any event, the potential benefits of the two-segment approach can only be realized at those 100 or so runways where the specialized ground based instrument landing system electronics are installed. By contrast, the quieting taking place as the result of modification or replacement of aircraft produces benefits throughout all approaches at all airports throughout the Nation.

Several commenters raised the issue of land use controls as a means of relief from aircraft noise impact. Land use is not at issue in this regulation, but like operational procedures, is a supplementary means advocated by the FAA to reduce adverse impacts. Land use controls such as zoning and utility limitations can prevent encroachment on an airport by incompatible land use. Recent Federal legislation dealing with funding for airports and airways includes provisions for purchase of land as a means of noise reduction near airports.

3. Less Stringent Standards

This group of alternatives includes:

(a) increasing the permissible noise levels.

(b) allowing continuance of tradeoffs and/or permitting certain classes of aircraft to meet ICAO Annex 16 rather than FAR Part 36 standards.

(c) excluding foreign operators and/or U.S. flag carriers from compliance with the planned rule.

(d) retrofitting JT3D aircraft only.

These alternatives are discussed below:

(a) Establishment of higher allowed noise levels at some or all of the FAR Part 36 measuring points cannot be justified when it has already been demonstrated that the FAR Part 36 standards can be met with practicable technology consistent with safety and economic feasibility.

(b) A similar form of relaxation of the stringency of the regulation would be the continued inclusion of tradeoff provisions and/or permitting certain aircraft to meet an alternative standard, ICAO Annex 16. The inclusion of tradeoffs would permit the standards to be exceeded at up to two of the measuring points to the extent that the exceedance is offset at the remaining point(s) by a lower than standard level. The existing FAR Part 36 and Annex 16 presently contain tradeoff provisions. In accordance with the intent of the Noise Control Act of 1972, the FAA policy is to increase the stringency of this rule where it is technologically practicable and economically reasonable. Since, in general, the existing modification technology will permit aircraft to meet the FAR Part 36 standards without tradeoffs, the tradeoff provisions have not been included in the regulation. For the FAA to act otherwise would be counter to the technological considerations in the Noise Control Act.

(c) Several commenters raised the issue of the application of standards to foreign operators, on the grounds that these carriers should be governed by standards promulgated by the International Civil Aviation Organization (ICAO). The FAA believes that action can and will be taken through ICAO to establish international agreements on operational noise standards. (Reference 25.) However, if standards are not adopted by ICAO the FAA will proceed with regulatory action to require foreign carriers to meet FAR Part 36 noise levels.

The FAA believes that prompt and serious attention should and will be given to this international issue because of the important contribution to noise accountable to international operations at some severely impacted airports throughout the World. Examples of the international share of operations at the five airports with over 60% of average daily international operations in 1972 are as follows:

Airport	International Operations No.	International Operations Portion of Daily Total	Foreign Flag Operations No.	Foreign Flag Operations Portion of Daily Total
New York (JFK)	284	29.8%	154	16.1%
Miami	119	19.2%	41	6.6%
Chicago O'Hare	63	3.8%	41	2.5%
Los Angeles	52	5.0%	31	3.0%
Boston	41	6.7%	25	4.1%

Because of their longer range and the extra fuel loads required, international flights tend to operate with higher gross weights than domestic flights and utilize long range 4-engine aircraft more frequently than the domestic flights. All these factors tend to create relatively higher noise levels associated with international operations as opposed to domestic operations. The following table provides an indication of the extent to which foreign carriers' operations would continue to contribute to the airport noise problem. Additionally, there is presently under consideration a proposal to expand international operations to additional airports (19), exposing other communities to these aircraft and their attendant noise. In any event the regulation will require the domestic operations of all U.S. flag carriers to meet the FAR Part 36 noise standards by 1985. Efforts will be expected through ICAO to bring the foreign international carriers operating into the U.S. as well as our own U.S. flag carriers which operate internationally under these same noise standards.

IMPACT OF EXCLUDING FOREIGN FLAG CARRIERS FROM THE STANDARDS
(NEF Value at a point one mile from touchdown)

	New York (JFK)	Miami	Los Angeles	Chicago O'Hare
No regulation	55	50	55	56
Regulation (all aircraft)	43	40	44	45
Regulation (U.S. aircraft only)	50	44	46	46
Regulation Benefit (all aircraft) (1 minus 2)	12	10	11	11
Regulation Benefit (U.S. only) (1 minus 3)	5	6	9	10
Benefit Loss if Foreign Aircraft Are Not Subject to Standards (4 minus 5)	7	4	2	1

(d) Another in this group of alternatives less stringent than the rule is a limited modification rule applying only to the JT3D powered airplanes. The FAA studied this alternative by modeling the national impact of regulating JT3D and JT8D powered aircraft and compared this to the impact of regulating only JT3D aircraft. A major factor is that the presence of JT8D powered aircraft is far more widespread than that of JT3D aircraft. They are much more numerous and operate more frequently at many more airports throughout the U.S. The analysis pointed out the predominance of JT8D aircraft noise:

- Nationally, JT8D accounts for some 70% of NEF 30 impacted areas.
- At the largest 25 airports JT8D accounts for between 70% and 90% of impacted area.

By requiring both the four-engine and two- and three-engine aircraft to meet FAR Part 36 noise levels, there will be an average reduction of 2 NEF units at the 25 largest air carrier airports at the time compliance is completed, compared to a reduction of only .5 NEF units if only the four-engine jets were phased out or required to comply. Additionally, many more airports would benefit from quieting of the two- and three-engine airplanes. Without including the two- and three-engine jets, which constitute 70 percent of that part of the operating fleet that does not meet FAR Part 36, 75 percent of the airports in the country would not receive any noise benefit.

Exemption of the JT8D powered aircraft from the regulation would have the effect of nullifying much of the environmental benefit and this exemption was therefore rejected as an alternative.

4. More Stringent Standards

Refan (or reengining) is the only technological approach that would allow the FAA to establish noise levels below those of the existing FAR Part 36 for the existing fleet. The refan design and test program to date has been limited to JT8D engines and to two aircraft (the B-727 and the DC-9). The SAM approach is the only one currently available for application to both the JT8B and JT3D engines.

The principles which contribute to noise reductions utilizing refan are (1) a reduction in jet velocities which reduces the jet exhaust component of the engine noise, and (2) a simultaneous reduction in turbomachinery noise through the use of SAM treatment. The NASA sponsored program with Pratt and Whitney Aircraft, McDonnell Douglas and the Boeing Company has explored the feasibility of modifying the JT8D engine to reduce the noise levels of the DC-9 and B-727 aircraft. To investigate this program objective the design of the two-stage fan on the JT8D engine was replaced by a single stage fan of large diameter and higher bypass ratio. This modification was designed to lower the noise by reducing the jet velocity and also to increase the static thrust by about 13 percent, to increase the cruise thrust by 5 percent, and to reduce the uninstalled Specific Fuel Consumption (SFC) by about 3 percent. The refan SFC reduction would probably be offset in part by a fuel penalty due to added weight. (There is an increase in aircraft operating empty weight of approximately 2500 and 3300 pounds, for the DC-9 and B-727-200, respectively.) This increase is reflected as a range decrease on the order of 85 and 95 nautical miles respectively.

The cost of refanning would be roughly eight to ten times the cost of using the SAM retrofit in the case of the 3-engine B-727. The overall program cost of refanning as opposed to SAM, accounting for all aircraft types, would be an increase by a factor of 5 (4).

The noise reduction for the refan configurations should generally be greater on takeoff than those of the SAM configurations whereas on approach they are roughly comparable. For the B-727-200 aircraft the refan noise reduction is projected to be about 5 EPNdB greater than SAM on takeoff with power cutback. On approach the noise reductions are projected to be about equal. The refan DC-9 configuration (5) is expected to be about 8 EPNdB quieter at takeoff with cutback than the SAM configuration and 3 EPNdB quieter on approach. When these reductions are incorporated as data into Noise Exposure Forecasts (NEFs) to assess the impact on the community, the refan of the JT8D combined with SAM of the JT3D engines would reduce the size of the NEF 40 area by about 90 percent and the NEF 30 by about 71 percent; whereas SAM alone would reduce the NEF 40 area by approximately 63 percent and the NEF 30 area by approximately 30 percent. Due to the extraordinary high cost differential for refanning JT8D engines it is not economically reasonable at this time to require separate lower noise levels for the existing fleet equipped with these engines.

The regulation does not affect business jets under 75,000 pounds. The acoustic modification potential for business jets is very limited. In exceptional cases, re-engining is possible, but in the general case this modification requires such extensive redesign (6) that it is not an economically justifiable alternative.

A final word on alternatives is in order. It can be argued that alternative schedules for FAR Part 36 compliance should be specifically addressed as alternatives to the proposed action. The NPRM on fleet noise requirements established a four-year period for compliance.

In establishing a deadline, the FAA has been concerned with the length of time needed to develop, certificate, produce, and install the necessary number of modification kits. The manufacturers have indicated that it will take six years to complete modification of the B-747s, B-727, B-737, and DC-9s, six to seven years to complete the B-707s, and possibly as long as nine years to complete the DC-8s, including kit production and installation time.

Modification kits are currently certificated and ready for installation for the two-and three-engine aircraft and the B-747s, and are being installed on those aircraft that are currently in production. It may take 28 months and 34 months, respectively, to design and certify kits for the B-707s and DC-8s,* with fabrication and installation time to follow. Thus, time to fabricate the required number of kits, and to install them during routine refurbishment periods for fleet aircraft must govern the mandatory compliance periods.

Further, providing for an eight-year period for compliance by the B-707 and DC-8 aircraft will provide more time for airlines to consider the replacement of these aircraft. There are noise and fuel benefits of replacement over engine modification. The specific benefits are not readily predictable, as they would turn on airline decisions to replace aircraft, available aircraft for purchase and possible legislation yet in the future which would assist the airlines in this regard. Accordingly, we have not attempted to quantify these imponderables at this time, except to point out that replacement would have additional environmental benefits. These factors limit the technological feasibility of alternative schedules and assessment of the impact of alternatives for the purposes of this final environmental impact statement.

*

Airplane	From Production Decision to First Kit Delivery	Production Rate in Ship-Sets Per Month
B-707	2-1/4 yrs	22
DC-8	3 yrs	8.5
B-727	1-1/2 yrs	38
B-737	1-1/2 yrs	10
DC-9	1-3/4 yrs	15
B-747	1 yr	5

IV. THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREAS

The regulation will afford present and future relief to public health and welfare from aircraft noise by reducing the noise exposure at and around air carrier airports. These reduced noise levels will result from extending the FAR Part 36 regulations to subsonic turbojet aircraft of 75,000 pounds or more.

A noise standard of broad scope, such as this one, will assist local jurisdictions in quantifying potential noise exposure by assuring maximum bounds on source noise. Intermediate term (5-10 years) land use planning will be facilitated by the maximum bounds on source noise implied in the rule. Since land acquisition costs (and pressures) to reduce aircraft noise impacts around airports may be reduced as a result, the regulation may provide greater flexibility for local development objectives.

V. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECT WHICH CANNOT BE AVOIDED

When certain aircraft are retrofitted with SAM they may suffer penalties in fuel consumption and some associated increased in the emission of air pollutants. On an overall basis these increases in consumption will increase U.S. energy consumption by a negligible amount. Changes in emissions have not been measured but since the acoustic modification does not involve any change to the combustors, increased emissions are not considered to be sufficient to cause these aircraft to affect air quality significantly.

In terms of a solid waste disposal problem, there may be a slight increase in the number of airplanes scrapped as a result of the regulation. The increase in scrappage due solely to the regulation is not ascertainable because of the number of airline management options vis a vis modification and replacement. Nevertheless, this scrappage is probably not significant as a national solid waste disposal problem, particularly since there is a demand for recycleable aluminum and other materials found in aircraft.

VI. SHORT-TERM VS LONG-TERM GAINS/LOSSES

The regulation does not involve any tradeoffs between short-term environmental gains at the expense of long-term losses or vice versa.

VII. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

The regulation will not curtail the range of beneficial uses of the environment. It is proposed as a method for enhancing these uses. No irreplaceable ecosystems or natural areas are endangered, nor are any adverse land use patterns being established. There are known risks to health and life anticipated. The possible slight degradation in air quality that has been identified will not be significant in terms of risk to health and welfare. This action will not preclude or interfere with the establishment and implementation of air quality standards for aircraft pursuant to the Clean Air Act. The small increase in fuel consumption that has been discussed is an irretrievable use of energy resources.

The material used in the modification kits will probably be irretrievably committed but at least some may be recyclable. For example, the Boeing Company estimates that 7185 pounds of raw materials are required to produce four JT3D modification kits with a total manufactured estimated weight of 3,450 pounds for a Boeing 707 type aircraft. None of the materials are currently in such short supply that modification might cause a significant market impact. Further details concerning materials usage as a result of the regulation can be found in Appendix C, Inflationary Impact Statement.

VIII. BENEFITS TO COUNTERBALANCE ADVERSE ENVIRONMENTAL EFFECTS

The adverse effects of the proposed action that have been discussed are considered minimal in relation to the large measure of noise relief that will be provided to the public.

IX. PUBLIC COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

Comments were received from 55 respondents distributed as follows:

Other Federal Agencies	8
Internal Federal Aviation Administration	7
State and Local Government Agencies including Airport Authorities	25
Private Citizens	2
Citizen Organizations	6
Foreign Respondents	4
U.S. Industry	2

The public comments are included in Appendix G. Some of the major issues raised by the respondents were discussed previously in Section III, Alternatives. The remaining issues are discussed below.

The Environmental Protection Agency rated the Draft LO-1 (lack of objections, adequate information) and encouraged early promulgation of the proposed rule.

The issues of the cost of modification and the impact on airline finances were raised by several respondents. By direction of the President, the Secretary of Transportation has scheduled a public hearing on December 1, 1976, in Washington, D.C., entitled "Financing of Aircraft Noise Reduction Requirements."

Non-capital costs, i.e., change in cash direct operating costs (fuel, crew, insurance, maintenance), lost productivity (due to increased weight of nacelles) and down time for installation were calculated to average, at a maximum, 0.2 percent of annual operating costs for the industry if a program of modification were accomplished in four years. For some airlines that increase would have approached a maximum of 0.3 percent of operating costs, while for most others the increase in cost will be close to zero percent.

Discussions of the impact of retrofit and replacement on the economy is contained in the Cost Benefit Analysis (Appendix D) and Inflationary Impact Statement (Appendix C). In general, there will be no significant impact on the prices of materials used for modification, or for fuel. Jet fuel consumption would increase by a maximum of 1 million barrels per year if all aircraft were modified (approximately 0.5 percent of 1974 consumption).

Several respondents raised the issue of the cost, benefit and effectiveness criteria employed by FAA in making a decision. In analyzing the various alternatives, two facts were evident: the more money spent, (up to a point) the greater the levels of noise reductions attainable; and, depending upon the alternative, a given level of effectiveness could be achieved at different costs, or for a given cost, different levels of effectiveness could be achieved. Two decision rules were:

1. When two alternatives yield the same effectiveness, the lesser cost alternative is preferred;

2. When two alternatives cost the same, the alternative generating the greater effectiveness is preferred.

Effectiveness was measured in terms of number of people and/or land area removed from the NEF 30 or NEF 40 noise exposure contour area. This criterion is based upon years of research by the Federal Government showing that there is a relationship between subjective response of individuals to airport noise and the cumulative noise exposure level. The criteria levels of NEF 30 and NEF 40 have been used by the Federal Government, particularly the Department of Housing and Urban Development, Department of Defense, Department of Transportation and the Environmental Protection Agency, for analyses, regulations and environmental decision making.

Several respondents questioned the use of the FAR Part 36 certification levels and/or the NEF analysis as the basis for decision making. These descriptors were not the sole methods of analysis. Appendix E contains examples of other types of analyses which are considered during the decision-making process:

1. Delta dB contours showing plots of equal reductions in EPNdB between the modified aircraft and unmodified aircraft;
2. 85dBA footprints showing the comparison between modified and unmodified aircraft;
3. Noise levels under the flight path for both modified and unmodified aircraft.

Thus, a total of five different types of analyses were performed. In general, they showed that the magnitude of the noise reductions which could be achieved varied by aircraft type, operational mode and location on the receiver on the ground. A significant, sizable proportion of people currently exposed to airport noise will benefit from the regulation. While few comments were received from the general public in response to the DRAFT EIS, several thousand letters from individuals and communities have expressed support for compliance with FAR Part 36 in response to the Notice of Proposed Rule Making.

Several respondents indicated that there was no need to modify older aircraft since most of the candidate aircraft would be removed from the fleet through attrition and replacement by quieter aircraft which do meet FAR Part 36. Forecasts of fleet mix show that almost half of the candidate aircraft will still be flown by airlines in the 1990 time period. The noise benefit to the public as shown in Section II is considered to be ample justification for the regulation. A similar argument was made for excluding foreign aircraft, i.e., that quieter wide-body jets would be used for international operations. Fleet forecasts do not support this contention. The regulation does not require modification; the method of achieving the regulatory noise levels includes modification or replacement.

The question of safety was raised with respect to the operational procedures discussed as alternatives to this regulation. Since this EIS addresses a modification of Federal Aviation Regulations pertaining to noise levels to be achieved through aircraft modifications, specific issues with respect to operational procedures need not be addressed. In general, however, there will be no requirement for any operational procedures which are determined to be unsafe. Any modifications to current operational procedures which are adopted, either through regulation or voluntary action by the airlines, will be safe and will enhance the benefits to be derived from this regulation.

Similarly, other technical aspects of the regulation will be addressed in the preamble to the rule. In general, the analyses of the environmental impact have assumed that available technology, determined through FAA and industry research and development programs, will be employed.

One respondent indicated that the benefit analysis should take into account not only the change in number of people exposed to noise within the NEF 30 and NEF 40 areas but also the relationship between NEF level and annoyance. Each of the metrics currently in use has advantages, disadvantages, apologists, and detractors. Historical use of NEF by the FAA calls for its use in this analysis for purposes of continuity. The objectivity of noise measures, as opposed to annoyance measures, is needed to perform comparative analytical studies. NEF serves well in this regard. See Appendix F for a discussion of the impact of noise on people.

Compliance dates were discussed by several respondents. In general, earlier compliance dates were desired by those who supported the regulation while those who opposed indicated that the compliance dates could not be met. Based upon our analysis of the data provided by the manufacturers, complete compliance within the schedule contained in the regulation is technologically feasible and economically reasonable. Experience with problems of modification will be closely monitored and, if warranted, adjustments to the completion schedule can be made. It should be noted that the compliance schedule does allow sufficient time to achieve the environmentally superior method of compliance: replacement.

The question of changes in air pollution emissions caused by modifications to engines was raised by one respondent. As indicated in the DEIS, test measurements of air pollutant emissions from JT3D and JT8D engined aircraft modified to meet FAR Part 36 standards have not been obtained. However, since the modifications do not involve changes to the engine combustion chambers, no fundamental changes in the pollutant production processed are expected. Further, no changes in thrust are anticipated during idle and taxi, and pollution emissions are expected to be unchanged during ground operations, the phase of activity that is most critical to the airport impact on air quality. During flight phases of operation, changes in emissions of modified engines are expected to be proportional to changes in fuel consumption.

Emissions from aircraft modified to comply with the regulation are expected to have a negligible effect on air quality and will not compromise the EPA aircraft emissions standards that are applicable today.

The State of Hawaii asked why small and medium hubs were not utilized in evaluating the alternatives. The data on noise benefits in the EIS is based on an extrapolation from a study of 23 major airports to all airports in the Nation. Accordingly, benefits at all airports have been utilized in assessing the alternatives described in the EIS.

The International Air Transport Association (IATA) questioned the benefits attainable from SAM modification of engines. This benefit has been discussed in detail in Section II. The available evidence strongly shows that the modification is an effective means of achieving noise relief and worthwhile in terms of economic reasonableness.

The benefits of the SAM modification are noticeable in both the cumulative unit, NEF, and in the individual event unit, EPNL, at certification measuring stations. The individual event basis, which shows a reduction of about 11 EPNdB on takeoff for the JT3D powered B-707 when certification procedures are used, is meaningful since reductions of this magnitude could be realized on a day-to-day basis. The issue of decreased SAM effectiveness with increased distances is not germane. All aircraft sounds are subject to increased high frequency absorption with increased distance; however, the SAM is effective at distances where it is needed.

IATA stated that the reductions assumed possible for the DC-8s are overly optimistic, seemingly based on what has been claimed possible for the B-707. Experience with the B-747 has shown the effect on noise of eliminating blow-in doors. Elimination of blow-in doors is also a feature of the B-707 modification kit. They pointed out that the DC-8s do not have blow-in doors in their baseline condition so this particular noise reduction element will not be available. Further, the DC-8-62s and -63s already have a long duct nacelle. For these and other reasons, they believe that noise reductions possible for the DC-8s are unlikely to be nearly as large as assumed in the draft EIS.

In response, the source noise increment between the B-707 and the DC-8 aircraft due to the blow-in door feature is approximately 1.5 EPNdB. The noise reductions for the -61 series for the DC-8 aircraft utilizing available SAM treatment consistent with the no trade-off requirements should therefore be essentially similar to those of the B-707. The DC-8s with the long duct nacelles should have an initial acoustic advantage, and it is therefore expected that these aircraft could meet the regulatory requirements with a correspondingly reduced economic impact.

IATA suggested that the FAA's 23 airport study was based on unrealistic assumptions concerning reapplication of climb thrust. The 23 airport study did not assume the use of FAR Part 36 certification type thrust cutback during takeoff. The subject of takeoff operational procedures is supplementary to that of noise source control through the use of SAM and by replacement with quieter aircraft, and has been discussed previously in Section III, Alternatives.

The Air Transport Association expressed doubts as to the flight acceptability of an inlet ring in some of the SAM designs for the sole purpose of reducing noise. The doubts are raised with respect to the effect of the ring on safety and reliability of service.

The use of inlet rings on the B-707 configuration has been extensively investigated from safety and reliability perspectives. There is, in the opinion of the reviewing FAA airworthiness personnel, no impediment to the certification of the inlet ring configuration.

ATA alleged that deletion of trade-off provisions would result in miniscule benefit to airport neighbors. The benefits on a single event basis would be in the order of three decibels and would definitely change the quality of the aircraft noise. There would be a decrease in speech interference from aircraft noise for airport neighbors, and on a cumulative basis the noise impact areas would be reduced in the order of 30 to 40 percent. The deletion of the trade-off requirements is necessary for FAA to comply with legislative requirements that all technologically feasible noise benefits be implemented consistent with economic reasonableness.

McDonnell Douglas Aircraft Company (DAC) suggested that the draft EIS implies that if an airport neighbor's noise exposure goes from NEF 40 to NEF 30, there will no longer be a noise impact. This is not the intent of the Draft EIS, since it is not alleged that this regulatory action will be a total solution to the noise problem. The regulatory action, will, however, upgrade the noise environment and in concert with other noise control actions should be expected to provide very meaningful improvements.

DAC maintained that the use of SAM treatment would only provide minimum relief for airport neighbors. The FAA does not share this view and believes that a reduction of the fan and compressor noise of aircraft engines would contribute to the improvement of airport acoustic environments. These benefits are discussed in Section II.

The National Aeronautics and Space Administration stated that the use of operational procedures in the impact analysis when such procedures are not required by FAA for noise certification testing is misleading. The operational procedure required by the FAA for the noise certification testing is not intended to be identical to operational procedures used in day-to-day airline operations which are variable from place to place and time to time depending on the circumstances. The procedures are, however, suitable and safe for such operations and could be required at specific airports to achieve the noise certification levels at the measurement stations. The primary object of test procedures is to characterize the source noise emissions of the aircraft and to permit comparisons between aircraft of similar types. The noise analysis methods used by FAA take into account operational procedures which are actually used or likely to be used in the future.

The State of Massachusetts asked why compliance by aircraft under 75,000 pounds was not required. The technology for retrofitting aircraft under 75,000 pounds takeoff gross weight has not been developed sufficiently to make a determination with respect to economic reasonableness. In many cases, the modification of these aircraft requires a reengining to comply with the FAR Part 36 levels. This in turn implies essentially new aircraft design and development program which would place an extensive economic burden on the owners and operators of these aircraft.

Massachusetts also suggested that FAA include flap management and deck angles in operations analysis. The ancillary nature of operations controls as a means of achieving noise reudction has led the FAA to consider these methods as subjects of separate rulemaking.

Citizens against noise suggested that FAA apply the rules to general aviation and military aircraft. Applicability of the rules is by weight class, rather than by type of operators. There is no need for general aviation aircraft to be singled out for special requirements since the rules already affect all aircraft in the appropriate weight class.

Modification of military aircraft must be addressed by the military since the FAA cannot apply noise standards to these aircraft. The military aircraft in many cases must optimize performance in the interest of national security at the expense of excessive noise.

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21 J.E. Mayer, et.al., "FAA JT3D Quiet Nacelle Retrofit Feasibility Program, Volume I-1, Lower Goal Design Fabrication and Ground Testing," The Boeing Company, Wichita Division, Federal Aviation Administration, Report No. FAA-RD-73-131, I-1, June 1973.

22. R.B. Tate, et.al., "727 Noise Retrofit Feasibility, Volume I. Lower Goal Design, Fabrication, Ground and Flight Testing," The Boeing Company, Commercial Airplane Group, Federal Aviation Administration Report, No. FAA-RD-72-40, I, March 1972.

23. "Noise Reduction Programs for DC-8 and DC-9 Airplanes," McDonnell-Douglas Corporation, Report No. MDC J4447B, July 24, 1974.

24. "Compilation of Air Pollutant Emissions Factors," U.S. Environmental Protection Agency, Office of Air and Waste Management, February 1976.

25. International Air Transportation Policy of the U.S., September 8, 1976.

APPENDIX A: NOTICES OF PROPOSED RULE MAKING

[14 CFR Part 91]

[Docket No. 13582; Notice No. 74-14]

CIVIL AIRCRAFT FLEET NOISE REQUIREMENTS

Notice of Proposed Rulemaking

The Federal Aviation Administration is considering amending the Federal Aviation Regulations to establish additional civil aircraft noise requirements. The proposed amendments would require that subsonic turbojet engine-powered airplanes with maximum weights of 75,000 pounds or more, and that are operated under Parts 91, 121, 123, 129, and 135 of the Federal Aviation Regulations, conform to Part 36—"Noise Standards: Aircraft Type and Airworthiness Certification."

Interested persons are invited to participate in the subject rulemaking process by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket, AGC-24, 800 Independence Ave. SW., Washington, D.C. 20591. All communications received on or before June 28, 1974, will be considered by the Administrator before taking action on the proposed rule. The proposal contained in this Notice may be changed in the light of comments received. All comments submitted will be available both before and after the closing date for comments, in the rule docket for examination by interested persons. Comments are specifically requested on the overall environmental aspects of this proposal.

This Notice is published after consideration of the comments received in response to Advance Notice of Proposed Rule Making, Notice 73-3, "Civil Airplane Fleet Noise Requirements" (Docket No. 12534), published in the FEDERAL REGISTER (38 FR 2769) on January 30, 1973 (hereinafter referred to as Notice 73-3).

Notice 73-3 proposed to control and reduce airplane noise emissions by establishing a limit on the fleet noise levels of each air carrier operating under Part 121 of the Federal Aviation Regulations. Three phases of noise limits were proposed to be effective in a progressive reduction manner. The first and second phases of fleet noise levels were to be determined in 1973 and 1976, respectively, through the application of a logarithmic equation using the individual noise levels and operations of each airplane within the carrier's fleet. The third and final phase in establishing fleet noise level limits would have required that by July 1, 1978, all airplanes in the carrier's fleet not exceed the Appendix C levels of Part 36 of the Federal Aviation Regulations.

The comments received in response to Notice 73-3 were almost unanimously opposed to the use, implementation, structure, mathematical relationship and general concept of the logarithmic equation for determining fleet noise levels. The comments suggested that the equation proposed mathematical manipulation of noise; that it did not give the desired credit for quieter aircraft; that it should be a linear relationship rather than logarithmic; that it did not include weight factors for day-night operations; that it did not credit a factor for community annoyance; and that it did not account for effective noise levels at different airports. While it is true that the proposed mathematical equation would not have satisfied many of the objections raised by the commentators, the primary objective of that equation was to assist the fleet operator in evaluating his fleet noise levels in relation to the noise limits proposed. The proposal would have accomplished that objective. However, upon review of all the comments received, including an analysis of alternative equations submitted in response to Notice 73-3, the FAA has determined that the objective of the fleet noise rule can be attained without the use of any mathematical equation.

In addition, a large number of comments expressed strong opposition to the proposed exclusion from the noise requirements in Notice 73-3 of airplanes used in overseas, foreign and intrastate operations by Part 121 operators. The commentators pointed out that such exclusion would deprive many of the major airports in the more noise sensitive areas of the benefits of the noise reduction provided by that Notice. In view of the foregoing, and after further consideration, the FAA now considers it appropriate to cover subsonic turbojet airplanes of U.S. registry weighing 75,000 pounds or more operated under Part 121, including those in overseas and foreign air commerce. Moreover, this proposal would cover all subsonic turbojet engine-powered airplanes of U.S. registry weighing 75,000 pounds or more operated under Parts 91, 123, and 135. As such, it would apply to corporate and other general aviation operators as well as air carriers, certain air taxi and commercial operators, and air travel clubs. However, so far as U.S. aircraft are concerned, it is proposed to limit the applicability under this Notice to airplanes having standard airworthiness certificates. The FAA has not determined that a retrofit to Part 36 noise levels for experimentally and provisionally certificated airplanes or airplanes having a restricted category certificate would be technologically practicable. It should be noted that there are a number of U.S. registered civil airplanes that are of the type covered by this proposal but that are operated entirely outside the United States. This proposal would not apply to those airplanes.

The FAA has given particular attention to the matter of including foreign civil turbojet engine powered airplanes weighing 75,000 pounds or more. On the one hand, it is preferable that environmental problems affecting international civil aviation, like other aviation problems affecting more than one nation, be resolved by the International Civil Aviation Organization (ICAO). The United States strongly supports the effort being made in ICAO to achieve uniformity in the noise reduction area. Uniform international noise standards are viewed as the best ultimate solution to the international aspects of the aircraft noise problem. The United States will thus continue to work through ICAO to establish appropriate international noise standards.

On the other hand, the FAA does not believe that foreign registered aircraft should be excluded from application of Fleet Noise Level regulations pending the development of appropriate international standards. The regulations that would be issued following this Notice must, under the Noise Control Act of 1972, be economically reasonable, technologically practicable, and appropriate to the type of aircraft to which they apply. To withhold applicability of reasonable standards to foreign aircraft would not be an appropriate response to the FAA's duty, under that Act, to protect the public from aircraft noise. In addition, excluding foreign aircraft could be unfair to U.S. operators of similar aircraft who would be forced to operate (in the same markets as foreign aircraft) with an economic burden of noise compliance that is not borne by the foreign operators. On balance, the FAA believes that equal and nondiscriminatory application of economically reasonable noise standards, to all operators, is an appropriate noise regulatory policy. Detailed comments from foreign operators (as well as U.S. operators) are invited with respect to the technological and economic aspects of this proposal. Such comments will be carefully reviewed prior to taking any action.

Since the U.S. aircraft covered by this proposal are limited to those that have U.S. Standard Airworthiness Certificates, the only foreign aircraft that would be covered are those that, if registered in the U.S., would be required by applicable Federal Aviation Regulations to have a U.S. Standard Airworthiness Certificate in order to conduct their intended operation in the United States. Finally, since the purpose of this proposal is to ensure that the takeoff, sideline, and approach noise levels of Part 36 are complied with, it would serve no useful purpose to apply those standards to foreign aircraft that merely overfly the United States (and thus do not expose airport environments to their noise levels). This proposal, therefore, would only cover foreign aircraft that land or take off in the United States.

A number of commentators recommended that compliance times earlier than those proposed in Notice 73-3 be established. The FAA does not agree. The compliance dates proposed were based primarily on the time requirements associated with the implementation of retrofit modifications to the forecast fleet of pre-Part 36 aircraft. Consideration was given to tooling for retrofit hardware production, the time required in obtaining airworthiness certification for engine nacelle-airframe combinations, material procurement lead time, and projected installation time. For these reasons, earlier compliance dates are not considered reasonable.

Several commentators indicated concern regarding the availability of retrofit hardware, and doubt that the rule would be economically reasonable. FAA's investigation shows that retrofit designs are either available or are being flight tested for many types of airplanes covered by this proposal and that these types constitute most of the fleet. FAA is aware that this proposal includes the relatively few pure turbojet engine-powered airplanes currently in service. No acoustic modification exists for these aircraft and expensive reengining could be required to achieve conformance with our standards. However, based on the rate at which these airplanes are being retired from service by U.S. operators, it appears that few, if any, would be in operation by 1978. As previously stated, the expected retrofit configurations are definable, and from these definitions, retrofit cost and impact on performance and weight can be estimated so one can assess whether retrofit is economically reasonable. Economic analysis of the cost impact of retrofit on the collective operators indicates that the proposed program of retrofit is economically reasonable, though individual operators may consider the costs to be a financial burden. The FAA notes that the Civil Aeronautics Board generally allows fare adjustments in the domestic air carrier industry to reflect increases in operating costs. However, the impact of retrofit will vary among individual carriers, and fare adjustment approvals retain uniformity of fares among competing carriers. In addition, the rates for flag carriers are established by the International Air Transport Association, which has stated that it favors retrofit by means of public funding rather than fare adjustments.

In the light of the comments received and after further review within the FAA, it is believed that a phased compliance with Part 36 of the Federal Aviation Regulations, including Appendix C, is the appropriate means of implementing fleet noise requirements. While this proposal retains many of the proposed requirements of Notice 73-3, it is substantially different in many respects. The significant comparisons are discussed in some detail hereinafter.

As proposed in Notice 73-3, this notice applies to turbojet engine-powered airplanes with maximum weights of 75,000 pounds or more. Contrary to numerous comments received in response to Notice 73-3, the FAA does not now consider it appropriate to propose these noise requirements for airplanes weighing less than 75,000 pounds. While it has been demonstrated that the manufacturers of some jets of less than 75,000 pounds maximum weight can, on a new design production basis, meet or better the noise levels prescribed in Part 36, this in itself does not justify a retrofit requirement for operators of jets in this weight category. The feasibility of potential application of these advances in small jet engine technology and the related costs in in-service retrofit are currently being evaluated. Therefore, jet airplanes with maximum weights of less than 75,000 pounds are not being included at this time.

All of the airplanes covered by the proposal, including those airplanes operated by air taxi operations, air travel clubs and those airplanes operated under Part 91, as well as the flag, domestic and supplemental air carriers and commercial operators operating under Part 121, would have to be in compliance with Part 36 by not later than July 1, 1978. Most of the Part 91 operators, the air taxi operators and the air travel clubs who have an airplane covered by this proposal in their fleet of airplanes generally have only one such airplane. Since the domestic, flag, supplemental air carriers and commercial operators operating under Part 121 and foreign air carriers operating under Part 129 have most of these airplanes, the impact of the operations of these operators far exceeds that of the other classes of users in terms of community noise exposure nationwide. For this reason it might be considered appropriate in the public interest to propose that the Part 121 and Part 129 operators have a significant portion of their airplanes meet the Part 36 requirements at an intermediate date. But as a consequence of engine/nacelle intermix problems prior to complete compliance of a total fleet and considerations of alternate retrofit cost for different compliance options, such a scheme, is impractical. To assure progress, though, it is now proposed that all domestic, flag, and supplemental air carriers and foreign air carriers, and commercial operators holding certificates under Part 121, cannot operate their subsonic turbojet engine-powered airplanes with maximum weights of 75,000 pounds or more after July 1, 1976, unless they can submit evidence that half of their inventory of engine/nacelles for these airplanes are of a type that has been demonstrated to permit these aircraft types to meet the requirements of Part 36 if the engine/nacelles were deployed in a full set.

Under this proposal, the operators would have the alternative of modifying existing airplanes, replacing them with other airplanes meeting the Part 36 requirements, or a combination of these actions.

None of the persons covered by this proposal should have any difficulty in determining whether an airplane has been shown to meet the Part 36 requirements since Part 36 requires that an entry to that affect be placed in the Airplane Flight Manual for the airplane.

As many commentators recommended with respect to Notice 73-3, this proposal provides for individual aircraft meeting the prescribed noise levels. However, this proposal does not, as suggested by some commentators, reduce the ultimate noise level for all airplanes to a minus (−) 10dB from the current Part 36, Appendix C. The FAA is addressing that matter in a separate rule-making action.

(Secs. 313(a), 601, 603, 604, and 611, Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1431 as amended by the Noise Control Act of 1972 (P.L. 92-574)); sec. 6(c), Department of Transportation Act (49 U.S.C. 1655(c)): Title I, National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.); Executive Order 11514, March 5, 1970).

In consideration of the foregoing, it is proposed to amend Part 91 of the Federal Aviation Regulations by adding a new Subpart E to read as follows:

Subpart E—Noise Requirements

Sec.
91.301 Applicability.
91.303 Relation to Part 36.
91.305 Interim noise requirements for air carriers.
91.307 Noise requirements for all airplanes.

Subpart E—Noise Requirements

§ 91.301 Applicability.

This subpart prescribes noise requirements for the operation, in the United States, of—

(a) U.S. registered civil subsonic turbojet engine-powered airplanes with maximum weights of 75,000 pounds or more and having standard airworthiness certificates; and

(b) foreign civil subsonic turbojet engine-powered airplanes with maximum weights of 75,000 pounds or more that land or take off in the United States and that, if registered in the United States, would be required by applicable Federal Aviation Regulations to have U.S. standard airworthiness certificates in order to conduct the operations intended for the airplane.

§ 91.303 Relation to Part 36.

Unless otherwise specified, all references in this subpart to the requirements of Part 36 of this chapter, include the noise levels of Appendix C of that Part, as effective on December 1, 1969, notwithstanding the provisions of that part excepting certain aircraft from those noise levels and notwithstanding the tradeoff provisions of that part.

§ 91.305 Interim noise requirements for air carriers.

After June 30, 1976, no domestic, flag, or supplemental air carrier or commercial operator holding a certificate under Part 121, of this chapter, or foreign air carrier holding a certificate under Part 129 of this chapter may operate, under that certificate, any airplane covered by this subpart and listed on the aircraft record required for domestic and flag air carriers or on the operations specifications required for the supplemental air carriers, commercial operators, and foreign air carriers, that is not shown to meet the requirements of Part 36 of this chapter unless at least one-half of the engine/nacelles for the airplanes covered by this subpart and listed for the certificate holder are of a design that has been shown to permit those aircraft types to meet the requirements of Part 36 if the engine/nacelles were deployed in a full set.

§ 91.307 Noise requirements for all airplanes.

After June 30, 1978, no person may operate any airplane covered by this subpart unless that airplane is shown to meet the requirements of Part 36 of this chapter.

Issued in Washington, D.C., on March 22, 1974.

R. P. Skully,
Director, Office of Environmental Quality.

[FR Doc. 74-7083 Filed 3-26-74; 8:45 am]

As published in the Federal Register (39 F.R. 11302) on March 27, 1974

[14 CFR Part 91]

[Docket No. 14317; Notice No. 75-5]

CIVIL SUBSONIC TURBOJET ENGINE-POWERED AIRPLANES: NOISE RETROFIT REQUIREMENTS

Proposed Regulations Submitted to the FAA by the Environmental Protection Agency

This notice of proposed rule making contains proposed regulations submitted by the Environmental Protection Agency (EPA) to the Federal Aviation Administration (FAA), pursuant to section 611 (c)(1) of the Federal Aviation Act of 1958, as amended by the Noise Control Act of 1972 (Pub. L. 92-574). Section 611 (c)(1) of the Federal Aviation Act of 1958 provides that EPA shall submit to the FAA proposed regulations to provide such control and abatement of aircraft noise and sonic boom as EPA determines is necessary to protect the public health and welfare. That section also provides that the FAA "shall consider such proposed regulations submitted by EPA under this paragraph and shall, within thirty days of its submission to the FAA, publish the proposed regulations in a notice of proposed rulemaking." This notice is published pursuant to this provision of law.

The EPA proposals contained herein would amend Part 91 of the Federal Aviation Regulations to require civil subsonic turbojet engine-powered airplanes to comply with the noise standards of Part 36 of the Federal Aviation Regulations.

Interested persons are invited to participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should identify the docket number and be submitted in duplicate to the Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket, AGC-24. Comments on the overall environmental aspects of the proposed rules are specifically invited. All communications received by the FAA on or before April 4, 1975, will be considered by the FAA Administrator before taking action upon the proposed rules. The proposals contained in this notice may be changed in the light of comments received. All comments will be available, both before and after the closing date for comments, in the FAA Rules Docket for examination by interested persons. EPA has also indicated that information copies of public comments may be sent to: Director, Standards and Regulations Division, Office of Noise Abatement and Control (AW-571) U.S. Environmental Protection Agency, 1921 Jefferson Davis Highway, Arlington, Virginia 20460.

Pursuant to section 611(c) of the Federal Aviation Act of 1958, the FAA will hold one or more hearings with respect to the proposals contained in this notice. A separate notice of hearing will be published in the FEDERAL REGISTER in the near future. As required by section 611(c), these hearings will be held no later than 60 days after publication of this document in the FEDERAL REGISTER.

The following EPA opinions, conclusions, and proposed regulatory language are published verbatim as received by the FAA on January 28, 1975.

EPA Proposal to FAA. Under the requirements of section 7(a) of the Noise Control Act of 1972 (Pub. L. 92-574, 86 Stat. 1234), the Administrator of the Environmental Protection Agency conducted a study of aircraft and airport noise and submitted a report thereon to the Congress. (Report on Aircraft/Airport Noise, Senate Committee on Public Works, Serial No. 93-8, Aug. 1973). Under section 611 of the Federal Aviation Act, as amended by the Noise Control Act of 1972, the Administrator of the EPA is also required, not earlier than the date of submission of his report to the Congress, to submit to the Federal Aviation Administration proposed regulations to provide such control and abatement of aircraft noise and sonic boom (including control and abatement of aircraft noise through the exercise of any of the FAA's regulatory authority over air commerce or transportation or over aircraft or airport operations) as the Administrator of the EPA determines is necessary to protect the public health and welfare. In accordance with the foregoing requirement, the EPA published in the FEDERAL REGISTER on February 19, 1974 (39 FR 6112) a notice of public comment period containing a synopsis of the proposed rules it is considering to achieve a satisfactory level of aircraft noise control and abatement for the protection of the public health and welfare.

The proposed rules and the type of control which each rule would implement are as follows:

Flight procedures noise control

(1) Takeoff procedures.
(2) Approach procedures.
(3) Minimum altitudes.

Source noise control

(4) Retrofit/fleet noise level.
(5) Supersonic civil aircraft noise.
(6) Modifications to Part 36 of the Federal Aviation Regulations.
(7) Propeller driven small airplanes.
(8) Short haul aircraft.

Airport operations noise control

(9) Airport goals, mechanisms and processes by which noise exposure of communities around airports can be limited to levels consistent with public health and welfare requirements.

This proposed rule, identified as the retrofit portion of item (4) above, is one of the five whose purpose is to implement engineering noise control at the source. As proposed herein the EPA believes that the rule, if adopted, would control and reduce the noise of civil subsonic turbojet engine-powered airplanes to levels as low as is consistent with available safe technological capability without imposing unreasonable economic burdens on the users of those airplanes.

A. *Regulatory background.* (1) Part 36, "Noise Standards: Aircraft Type Certification," became effective December 1, 1969 (34 FR 18355), prescribing noise measurement, noise evaluation, and noise levels for the type certification, and changes to those certificates, for subsonic transport category airplanes, and for subsonic turbojet engine-powered airplanes regardless of category.

(2) Part 36, "Noise Standards: Aircraft Type Certification" was subsequently amended on October 26, 1973 (38 FR 29574), to require new production subsonic transport category and subsonic turbojet engine powered airplanes regardless of category to comply with the noise requirements of Part 36 irrespective of the date of the type certification.

(3) Advance notice of proposed rulemaking 70-44, "Civil Airplane Noise Reduction Retrofit Requirements," published on November 4, 1970 (35 FR 16980), proposed the retrofit of existing subsonic turbojet engine powered airplanes. This proposal has not been adopted as a final rule.

(4) Advance notice of proposed rulemaking 73-3, "Civil Airplane Fleet Noise (FNL) Requirements," published on January 30, 1973 (38 FR 2769), proposed the establishment of an interim upper limit on the cumulative noise levels of each fleet operator. Under the FNL concept there would then be a phased progressive reduction of those noise levels in accordance with a logarithmic equation until July 1978, when every airplane would be required to meet the noise standards of Appendix C of Part 36. Although the FAA was of the opinion that the FNL concept is considered to be the most appropriate course to follow within current technological capabilities, it expressly stated in the notice that the FNL concept did not imply a rejection of the retrofit program.

(5) After considering the comments in response to the foregoing ANPRM 73-3, NPRM 74-14—"Civil Aircraft Fleet Noise Requirements" was published on March 27, 1974 (39 FR 11302). Under the proposal civil subsonic turbojet engine-powered airplanes with maximum weights of 75,000 pounds or more would be required to conform to Part 36—"Noise Standards: Aircraft Type and Airworthiness Certification". As distinguished from the former ANPRM 73-3, Notice 74-14 would not utilize a logarithmic equation for the determination of fleet noise levels and would apply to all civil subsonic turbojet engine-powered airplanes having standard airworthiness certificates, weighing 75,000 pounds or more, and operated under Parts 91, 121, 123, 129 and 135. Although the FAA preferred that environmental problems affecting international civil aviation be resolved by ICAO, it did not believe that foreign registered aircraft should be excluded from a fleet noise level rule pending the development of appropriate international standards. Accordingly, as proposed, the rule was made applicable to foreign aircraft while operating in the U.S., except in the case of overflights.

B. *References*. In the development of this proposed rule, the EPA conducted its own studies and evaluated several pertinent studies made by other Federal agencies and private contractors. Those studies are listed herein for the information of all interested persons and are available for examination at the FAA Rules Docket Office, GC-24, 800 Independence Avenue, SW., Washington, D.C. 20590, or the EPA Office of Noise Control Programs, Crystal Mall No. 2, 1921 Jefferson Davis Highway, Arlington, Va. 20460. Copies of these studies prepared by Government Agencies are also for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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

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

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

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

(5) "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, July 27, 1973.

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

(7) "Standard Noise/Performance Data for Retrofit Studies" Letter from R. E. Russel (Boeing) to R. P. Skully, FAA, dated December 21, 1973.

(8) "727 Noise Retrofit Feasibility, Volume III: Upper Goal Flight Testing and Summary", Final Report FAA-RD-72-40, III, January 1973.

(9) "Refan Design Presentation", NASA Contract NA53-16814, Douglas Aircraft Co., January 16, 1974.

(10) "Aircraft Noise Reduction Technology", Report by the National Aeronautics and Space Administration to the Environmental Protection Agency for the Aircraft/Airport Noise Study, March 30, 1973.

(11) "Allocating the Costs of Alleviating Subsonic Jet Aircraft Noise", Special Report, Institute of Transportation and Traffic Engineering, University of California, Berkeley, February 1967.

(12) "Airline Industry Financial Analysis with Respect to Aircraft Noise Retrofit Programs", OST-ONA 73-1, January 1973.

(13) "Impact of the New Large Jets on the U.S. Air Transport System, 1970-1975", CAB, October 1973.

(14) "Noise Standards for Civil Subsonic Turbojet Engine-Powered Airplanes (Retrofit and Fleet Noise Level)", EPA Project Report, December 16, 1974.

C. *Introduction*. As applied to aircraft, source noise control is the application of basic design principles or special hardware to the engine/airframe combination to minimize the generation and radiation of noise. The technology of source noise control is time-dependent in that it is based upon the results of current, available, and future technology.

Current technology includes "shelf item" hardware and commonly known techniques and procedures that have been used effectively by some manufacturers. Available technology represents the results of research and development that have not been put into common practice but are available for implementation. Some performance testing may still be necessary, but reliability and effectiveness have been demonstrated in the laboratory and on model and full scale tests. Future technology represents the results of research now in progress that have not been fully tested but the results to date indicate high potential to a reasonable degree of confidence.

There is no doubt that the most effective use of technology to achieve maximum noise control is the design and development of new aircraft types. Applications of basic design principles and acoustical treatment for the control of noise can be exploited optimally when they can be integrated into the overall aircraft/engine design. Admittedly, modifications such as retrofit hardware are the least efficient use of that technology. The EPA believes that regulations for the control of aircraft noise should be constructed to be equally responsive to all technology, i.e., current, available and future, and to the extent practicable, be made applicable to all aircraft, i.e., existing, new production of an older type design, and new production aircraft of a new type design.

At the present time, there is a choice between two possible technical retrofits for noise reduction. One is known as "Quiet Nacelles" with "SAM", a sound absorbing material technology and the other is known as "Refan", a replacement of selected fan and turbine components within the engine, as well as nacelles with SAM. The Quite Nacelle technology is current for JT8D engines and available for JT3D engines, while the Refan technology may be available in the near future.

The noise proposals set forth in NPRM 74-14 only apply to available and current technology, i.e., Quiet Nacelles with SAM. Applications of future technology, i.e., Refan technology, would not be required unless subsequent amendments are adopted. Therefore, the EPA has advised the FAA that although it supports the proposals set forth in NPRM 74-14, some modifications would be necessary to bring significant relief to the public exposed to the airplanes covered by the proposed rule.

This new notice of proposed rule making is based upon the requirements proposed in NPRM 74-14 as modified by the recommendations submitted by the EPA pursuant to the mandates of section 611 of the Federal Aviation Act. Initially, it should be noted that these modified proposals apply to all civil subsonic turbojet engine-powered airplanes, regardless of weight, certificated in the standard airworthiness category. As proposed herein, they would also apply to foreign registered airplanes, operated within the U.S., except those engaged in overflights. However, since the retrofit requirements contained in this proposal reflect current and available SAM technology only, the EPA believes that the concept of a fleet noise level (FNL) similar to that proposed in NPRM 73-3 should also be considered to apply the benefits of future technology, such as a Refan, Core Engine, or Quiet Engine retrofit. The EPA accordingly is proposing a FNL rule to the FAA which would provide information that would be of assistance once future technology is determined to be current and available, in determining how and when such future technology should be applied to existing fleets.

The NASA Refan program directed to the JT8D powered airplanes indicates that a Refan retrofit for those airplanes may be practicable and perhaps superior to Quiet Nacelles in terms of lower noise levels as well as performance benefits. If so, a careful consideration should be given to a further retrofit or double retrofit program for those JT8D engine propelled airplanes previously retrofitted with Quiet Nacelles. The NASA Refan program, however, will not be completed before June of 1975, and even then additional performance and airworthiness testing will be required before the results of that program can be categorized as available technology.

The Air Transport Association (ATA) has stated in its comments to NPRM 74-14 that if any technology is to be applied to an existing machine as complex as a transport airplane, it should be fully developed, its effects should be known, the cost should be determinable, and the environmental improvement should be sufficient to justify the expenditure. The EPA shares this concern. Therefore, pending the results of the NASA Refan program the EPA has advised the FAA that it will withhold the submission of any proposal to implement the Refan retrofit of turbojet engine-powered airplanes. Should the results of that program indicate that Refan retrofit is practicable, economically reasonable, and will provide meaningful relief, the EPA will then submit a recommendation proposing to adjust Fleet Noise Level (FNL) requirements consistent with the noise level reductions available from Refan or other programs.

As previously stated, the EPA strongly supports the noise reduction requirements proposed by the FAA in NPRM 74-14. Therefore, to the extent that those standards are included herein it appears unnecessary to repeat the detailed justification set forth in that NPRM in support of those requirements. However, the principal differences between that NPRM and this proposed rule in regard to its applicability and the required installation of engine/nacelles listed by an operator are discussed herein under separate headings.

D. *Applicability*. As proposed in NPRM 74-14 the noise reduction requirements would apply to airplanes having a maximum weight of 75,000 pounds or more. The EPA believes that all turbojet engine-powered airplanes having a maximum weight of less than 75,000 pounds that do not meet the noise levels prescribed in Part 36, are capable of meeting those levels by applications of various retrofit or reengine options. Since all newly produced airplanes of that type must comply after January 1, 1975 with the noise levels prescribed in Part 36 (§§ 21.183(e) and 36.1(d) of the Federal Aviation Regulations, there appears to be no valid justification to permit those airplanes in the existing fleets to be operated indefinitely at their present noise levels. Therefore, as proposed herein, § 91.301 would apply the noise requirements of the proposed subpart E to all civil subsonic turbojet engine-powered airplanes regardless of weight.

For the reasons stated in NPRM 74-14, this proposal would also apply to all foreign civil airplanes when operating in the U.S. except when engaged in overflights. Since such overflights would not involve a takeoff or landing at an airport in the U.S., there is no need to include them in this proposal. The rule as proposed herein would also except airplanes not having standard airworthiness certificates such as those airplanes having an experimental, provisional, or restricted airworthiness certificate. As stated in NPRM 74-14, the FAA has not determined that a retrofit to Part 36 noise levels for those airplanes would be technologically practicable at this time.

E. *Installation of engine/nacelles.* As distinguished from NPRM 74-14, § 91.305 (c) of this proposal would require the scheduled installation of each engine/nacelle on operational airplanes of the operator, if he lists such engine/nacelles as part of his "on-the-shelf" inventory. The EPA believes that a proper noise reduction for each airplane is not achieved until all of the engine/nacelles for that airplane are retrofitted. Therefore, proposed § 91.305(a)(2) would also require the operator, after June 30, 1976, to have at least one-half of the modified engine/nacelles for those airplanes listed by the operator in its aircraft record or operations specifications. But under the proposed § 91.305(c) the remaining engine/nacelles stored in its warehouse, for example, could not be included as part of the required number, unless a schedule is established and maintained for the installation of those engine/nacelles on operational airplanes at the next periodic inspection that will permit their installation.

As drafted, the provisions of the proposed § 91.305(c) permit the Administrator to authorize the installation at a time other than that specified in the operator's schedule upon demonstration to the Administrator that compliance with the schedule would adversely affect the safety of the airplane involved due to such intermix problems as unbalanced weight, thrust, drag, etc.

F. *Compliance dates.* As proposed herein the compliance dates are the same as those proposed in NPRM 74-14. Comments received in response to that NPRM contained estimates for the lead time to deliver retrofit kits for the various U.S. manufactured airplanes which ranged from 9 to 12 months for the B-747 airplane, and 10 months for the B-727 airplane. For the DC-8, however, one commentator estimated 30 months.

In response to previous comments regarding the availability of retrofit hardware, an investigation was conducted by the FAA and it was determined that retrofit designs are either available, or are being flight tested for the many types of airplanes covered by this and previous retrofit proposals. Research and development done to date has demonstrated that the basic concepts of noise suppression of turbofan engines are valid acoustically, and materials and fabrication technologies can be developed to translate these concepts into hardware that could provide an economically reasonable and a technologically practicable means of significantly reducing the noise generated by most currently certificated turbofan engine-powered airplanes. The FAA believes that if all persons (manufacturers and operators) make a determined effort to comply with the retrofit of the airplanes covered by this proposal it can be accomplished within the compliance dates specified. The FAA is aware that this proposal includes the relatively few pure turbojet engine-powered airplanes currently in service. Since no acoustic modification exists for these engines, reengineing may be required to achieve conformance with the noise levels proposed herein by July, 1978. However, based upon the rate which these airplanes are being retired from service by U.S. operators it appears that few, if any, would remain in service in the U.S. by that date.

Retrofit technology is available for all other transports and most of the business jets. The remainder of the business jets as subsequently discussed under the retrofit technology (G), could be in compliance with Part 36 noise levels by July 1, 1978, by implementation of one of the reengine options.

As proposed in this notice, all airplanes covered by the proposal, (including those airplanes operated by air taxi operators, air travel clubs, and by persons in the furtherance of a business under Part 91) would be required to be in compliance with the Part 36 noise standards not later than July 1, 1978. However, since the air carriers (U.S. and foreign) operate most of the flights of the airplanes covered by this proposal, those operations far exceed operations by other persons in terms of community noise exposure nationwide. For that reason, the intermediate compliance date for one phase of the retrofit was retained in this proposal for airplanes having a maximum weight of 75,000 pounds or more and operated by the holder of a certificate under Parts 121 or 129 of the Federal Aviation Regulations.

G. *Current and available retrofit technology.* In May 1967, NASA contracted with the McDonnell Douglas Corporation and the Boeing Company to investigate nacelle noise control modifications for operational Douglas and Boeing transports powered by JT3D turbofan engines. The NASA program successfully demonstrated by flight tests in 1969, conceptual feasibility of nacelle modifications for controlling both approach and takeoff noise of JT3D propelled aircraft.

In June 1971, the FAA initiated a nacelle noise control project directed to retrofit of the current fleet of narrow body aircraft. This project extended the NASA program to include research and development of takeoff and approach noise control for both JT3D and JT8D propelled aircraft. The purpose of this project was to provide test data to assist in determining whether certain classes of turbofan propelled airplanes in the current fleet could be modified for meaningful noise reduction in a feasible manner. The research and development work was directed to providing acoustical treatment for engines/nacelles which would permit compliance with specified noise reduction goals and which would be flight weight, flight worthy, and capable of being certificated.

The FAA project was implemented by means of three separate contracts with appropriate airframe manufacturers. A task force consisting of representatives from the research and development, regulatory, and airworthiness services of the FAA was also established to monitor the progress of those contractors and to insure that a judgment of the feasibility of noise abatement retrofit modifications was based upon production hardware that would not compromise safety.

The results of the foregoing FAA nacelle retrofit project produced flight performance and cost data for 707, DC-8, 727, 737, and DC-9 type airplanes equipped with acoustical treatment which would permit compliance with the FAR 36 noise levels. The acoustical treatment investigated included sound absorption material (SAM) and a combination of SAM and a jet noise reducer (JNR). It was found that the least complex system consisting of SAM would enable the airplanes to achieve the FAR 36 noise levels or lower in some cases. It was also found that the more complex systems consisting of SAM+JNR have the capability of decreasing the noise to levels appreciably lower than those required by FAR 36.

Quiet Nacelles containing SAM have a negligible effect on aircraft performance and provide a practicable means for the older narrow bodied transport type airplanes to comply with FAR 36. There appears to be no appreciable degradation in field length requirements and direct operating costs but possibly a small loss in range for the airplanes so modified. However, there would be a meaningful reduction in airport community noise exposure; mainly for approach operations for JT8D propelled aircraft and for both takeoff and approach operations for JT3D propelled aircraft.

It was found that quiet nacelles containing SAM+JNR, in addition to costing more per shipset, would introduce substantial degradation in performance. The performance losses, however, are not necessarily irreversible. Uprating the airframe for loading and the engine for thrust (e.g., JT8D–9 to JT8D–15) will increase the range and reduce the required field length to values approaching those of the baseline production version. Quiet Nacelles with SAM are current and available technology for the Boeing family of JT3D and JT8D propelled airplanes. For the B–727 and B–737 airplanes, the treatment is minimal; the noise reduction benefits are negligible for sideline and takeoff but significant on approach, and the costs and performance losses are so modest that it is unreasonable not to include such treatment on all new aircraft. For B–707 airplanes, the treatment is more extensive: the noise reduction benefits are substantial at all three measuring positions but especially dominant at approach; the performance losses are small; and the costs are significant but not necessarily unreasonable from a cost-effectiveness viewpoint.

Quiet Nacelles with SAM are also current and available for the Douglas family of JT3D and JT8D propelled airplanes. The QN technology is current and available state of the art and the first nacelles or retrofit kits for those airplanes covered by this proposal could be delivered about six months after the effective date of a retrofit regulation.

With respect to those airplanes covered by this proposal which have a maximum weight less than 75,000 pounds, approximately 20 percent of those airplanes (the Falcon 20 and Cessna Citation) are powered by moderate bypass ratio turbofan engines certificated in accordance with the noise requirements of Part 36. The remaining 80 percent are powered by turbojet or very low bypass ratio turbofan engines with noise characteristics similar to that of the straight turbojet. The Gulfstream 2, the largest airplane in this class, has a takeoff and sideline noise level in excess of the FAR 36 requirements. However, Grumman, in concert with Rolls Royce, has defined a program to develop a noise suppression kit for that airplane utilizing hardware developed for the F28 and BAC111 which will meet the FAR 36 requirements.

The rest of the airplanes in the General Aviation fleet are powered by small (3000 to 3500 lbs. thrust) turbojet engines which are extremely compact engines. Since small engines are less tolerant of disturbances to the basic thermodynamic cycle, small size in itself can be a problem with regard to the application of sound absorption materials (SAM) in the engine nacelle. There are, however, reengine options available for the airplanes that will permit compliance with the FAR 36 requirements before the June 30, 1978, compliance date proposed herein.

For those airplanes that are marginally shy of meeting the FAR 36 requirements (Learjet, for example), a modified exhaust nozzle may be all that is necessary to meet the current standard. Such a program is being conducted with the potential to certify the Learjet to the FAR 36 noise requirement with a redesigned exhaust nozzle.

H. *Cost/Effectiveness of Retrofit.* As stated in the preamble to NPRM 74–14 an economic analysis of the cost impact of a retrofit on the collective operators indicates that it is economically reasonable, although individual operators may consider the costs to be financially burdensome. With respect to those airplanes covered by this proposal that are operated by U.S. and foreign air carriers the FAA has noted that the Civil Aeronautics Board generally allows fare adjustments in the domestic air carrier industry to reflect increases in operating costs. This adjustment would undoubtedly include the impact of retrofit as it affects the individual carriers. Fare adjustments to reflect increases in the operating costs for U.S. or foreign flag carriers should be made in a similar manner by the International Air Transport Association (IATA). Other means of financing may be considered.

For both JT8D and JT3D airplanes, the investment cost would be approximately 648 million dollars. Based upon the projected 1980 fleet of its members, the ATA estimates the cost of a SAM retrofit to be in excess of one-half billion dollars, including $27,674,000 for increased fuel costs and $2,420,000 for increased maintenance costs for the B–707 airplanes. (Comments of the ATA to NPRM 74–14.) The IATA estimates the modifications to cost approximately one million dollars for each 4 engine turbojet airplane, and roughly $250,000 for each two and three engine turbojet airplane. It estimates the total cost for all its world wide members to be approximately 1.5 billion dollars. (Policy Statement on Noise Retrofit, IATA).

EPA estimated that the cost of modifying the jet fleet of airplanes having a weight of less than 75,000 pounds to comply with FAR 36 levels is approximately 0.3 billion dollars.

Implementation of the retrofit options of Quiet Nacelles to the JT3D and JT8D fleet would effect a substantial decrease in the impact of noise on people. Based upon the noise impact methodology of Reference 14, the EPA estimates that the equivalent number of persons exposed to a Day-Night Level (Ldn) of 75 dB will be over 800,000 fewer people, nationally. This estimate includes, in addition to Quiet Nacelles, the combined effects of the introduction of new quieter aircraft into the fleet and the use of a two-segment approach procedure.

In consideration of the foregoing, it is proposed to amend Part 91 of the Federal Aviation Regulations by adding a new Subpart E to read as follows:

Subpart E—Noise Requirements

Sec.
91.301 Applicability.
91.303 Relation to Part 36.
91.305 Interim noise requirements: subsonic turbojet engine-powered airplanes having a maximum weight of 75,000 pounds or more.
Sec.
91.307 Noise requirements: all subsonic turbojet engine-powered airplanes.

Subpart E—Noise Requirements

§ 91.301 Applicability.

This subpart prescribes noise requirements for the operation within the United States of any civil subsonic turbojet engine-powered airplane having

(a) A U.S. registration certificate and a standard category airworthiness certificate; or

(b) A foreign registration certificate and lands or takes off in the United States in the conduct of an operation for which a U.S. registered airplane is required to have a standard category airworthiness certificate.

§ 91.303 Relation to Part 36.

Unless otherwise specified, all references in this subpart to the requirements of Part 36 of this chapter, include the noise levels of Appendix C of that Part, as effective on December 1, 1969, notwithstanding the provisions of that part excepting certain aircraft from those noise levels and notwithstanding the tradeoff provisions of that part.

§ 91.305 Interim noise requirements: subsonic turbojet engine-powered airplanes having a maximum weight of 75,000 pounds or more.

(a) U.S. air carriers and commercial operators. After June 30, 1976, no person holding a certificate under the provisions of Part 121 of this chapter may operate, under that certificate, an airplane covered by this subpart having a maximum weight of 75,000 pounds or more, unless—

(1) That airplane meets the requirements of Part 36 of this chapter; or

(2) The certificate holder has demonstrated to the Administrator that at least one-half of the engine/nacelles for all the airplanes covered by this subpart having a maximum weight of 75,000 pounds or more and listed by the certificate holder in its aircraft record or operations specifications, as the case may be, are of a design that permits those aircraft types to meet the requirements of Part 36 if the engine/nacelles were deployed in a full set.

(b) *Foreign air carriers.* After June 30, 1976, no foreign air carrier holding operations specifications under the provisions of Part 129 of this chapter may operate, under those operations specifications, any airplane covered by this subpart having a maximum weight of 75,000 pounds or more unless—

(1) That airplane meets the requirements of Part 36 of this chapter; or

(2) The air carrier has demonstrated compliance with the requirements of paragraph (a)(2) of this section.

(c) *Installation of engine/nacelles.* Each person authorized to operate an airplane under the provisions of paragraph (a)(2) of this section shall establish and maintain a schedule for the installation of the engine/nacelles required by that paragraph on airplanes listed in its aircraft record or operations specifications, as the case may be. Unless otherwise authorized by the Administrator for reasons of safety, such as unbalanced weight, thrust, or drag, each installation shall be scheduled to be performed at the first periodic inspection of the airplane at which the ground time is adequate to perform the installation.

§ 91.307 Noise requirements; all subsonic turbojet engine-powered airplanes.

After June 30, 1978, no person may operate any airplane covered by this subpart unless that airplane meets the requirements of Part 36 of this chapter.

(Secs. 313(a) 601, 603, and 611, Federal Aviation Act of 1958 (49 U.S.C. 1354(a)), 1421, 1423, 1424, and 1431 as amended by the Noise Control Act of 1972 (Pub. L. 92-574); sec. 6(c), Department of Transportation Act (49 U.S.C. 1655(c)).)

Issued in Washington, D.C. on February 20, 1975.

CHARLES R. FOSTER,
Director of Environmental Quality.

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APPENDIX B: SUMMARY UNITED STATES AIRCRAFT FLEET FORECAST

PROJECTED U.S. AIR CARRIER FLEET

(at end of indicated year)

BASE CASE

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	45	45	45	45	45	45	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	275	314	354	395	438	472	505	539	572	606	639	939
B-707, DC-8 & B-720	N	487	400	395	391	369	346	314	292	270	248	227	212	0
B-727	C	248	427	436	476	504	542	542	542	542	542	542	542	542
	N	572	500	479	459	438	418	397	376	355	335	314	293	8
	TOTAL	820	927	915	935	942	960	939	918	897	877	856	835	550
B-737 & DC-9	C	59	303	389	457	508	565	623	686	765	815	866	916	1376
	N	480	463	456	448	441	433	426	421	415	410	404	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	0	0	0	0	58	112	165	196	228	259	574

*STATUS CODES:
M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

PROJECTED U.S. AIR CARRIER FLEET (continued)

(end of indicated year)

CASE 1: 100% MODIFY

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	37	30	23	17	10	3	0	0	0	0	0	0
	M	0	8	15	22	28	35	42	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	275	314	354	395	438	472	505	539	572	606	639	939
B-707, DC-8 & B-720	N	487	390	319	250	173	100	50	22	0	0	0	0	0
	M	0	10	76	141	196	246	246	270	270	248	227	212	0
	TOTAL	487	400	395	391	369	346	296	292	270	248	227	212	0
B-727	C	248	427	436	476	504	542	542	542	542	542	542	542	542
	N	572	295	157	20	0	0	0	0	0	0	0	0	0
	M	0	205	322	439	438	418	397	380	358	337	314	293	8
	TOTAL	820	927	915	935	942	960	939	918	897	877	856	835	550
B-737 & DC-9	C	59	303	389	457	508	565	623	686	764	815	865	916	1376
	N	480	291	154	7	0	0	0	0	0	0	0	0	0
	M	0	172	302	441	441	433	426	421	416	410	405	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	0	0	0	0	58	112	165	196	228	259	574

*STATUS CODES: M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

NOTE: The above projected schedule indicates airplanes remaining in status category N beyond the 12-31-84 ultimate compliance date. The difference, however, does not significantly impact the subsequent conclusions concerning the benefits, costs, or the related analyses predicated on these projections.

PROJECTED U.S. AIR CARRIER FLEET (continued)

(end of indicated year)

CASE 2: RETROFIT/MODIFY JT-3D AND MODIFY JT-8D

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	37	25	14	10	6	3	0	0	0	0	0	0
	M	0	8	20	31	35	39	42	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	264	302	341	369	397	421	454	488	521	555	588	888
B-707, DC-8 & B-720	N	498	444	360	270	160	60	30	10	0	0	0	0	0
	M	0	10	34	64	84	100	100	100	100	100	100	100	0
	TOTAL	498	454	394	334	244	160	130	110	100	100	100	100	0
B-727	C	248	380	386	423	395	334	334	334	334	334	334	334	334
	N	572	295	157	20	0	0	0	0	0	0	0	0	0
	M	0	205	322	439	438	418	397	380	358	337	314	293	8
	TOTAL	820	880	865	872	833	752	731	714	692	671	648	627	342
B-737 & DC-9	C	59	303	389	457	508	565	623	686	764	815	865	916	1376
	N	480	291	154	7	0	0	0	0	0	0	0	0	0
	M	0	172	302	441	441	433	426	421	416	410	405	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	43	86	183	277	366	422	473	490	516	534	779

*STATUS CODES: M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

NOTE: The above projected schedule indicates airplanes remaining in status category N beyond the 12-31-84 ultimate compliance date. The difference, however, does not significantly impact the subsequent conclusions concerning the benefits, costs, or the related analyses predicated on these projections.

PROJECTED U.S. AIR CARRIER FLEET (continued)
(end of indicated year)

CASE 3: REPLACE JT-3D AND MODIFY JT-8D

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	37	25	14	10	6	3	0	0	0	0	0	0
	M	0	8	20	31	35	39	42	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	264	302	341	369	397	421	454	488	521	555	588	888
B-707, DC-8 & B-720	N	497	454	394	334	244	154	98	10	0	0	0	0	0
B-727	C	248	381	387	424	396	335	334	334	334	334	334	334	334
	N	572	295	157	20	0	0	0	0	0	0	0	0	0
	M	0	205	322	439	438	418	397	380	358	337	314	293	8
	TOTAL	820	881	866	873	834	753	731	714	692	671	648	627	342
B-737 & DC-9	C	59	303	389	457	508	565	623	686	764	815	865	916	1376
	N	480	291	154	7	0	0	0	0	0	0	0	0	0
	M	0	172	302	441	441	433	426	421	416	410	405	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	43	86	183	281	435	503	545	567	588	606	782

*STATUS CODES: M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

NOTE: The above projected schedule indicates airplanes remaining in status category N beyond the 12-31-84 ultimate compliance date. This difference, however, does not significant impact the subsequent conclusions concerning the benefits, costs, or the related analyses predicated on these projections.

APPENDIX C: IMPACTS ON NATIONAL ECONOMY:

INFLATIONARY IMPACT STATEMENT

THE INFLATIONARY IMPACT OF THE PROPOSED AIRCRAFT NOISE REGULATION

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EXECUTIVE SUMMARY

This report examines the question of whether or not inflationary impacts would result from enactment of the proposed FAR Part 36 Noise Compliance Regulation. Three air carrier industry responses to the proposed change are postulated, and each is examined to determine the likely effects on materials and employment within the aircraft manufacturing industry as well as in key supplying industries. This analysis is conducted for the peak year in each case, i.e., the year in which the projected incremental financial effect of the change in regulations over the baseline projection is the greatest. Under each of the three cases examined, it is concluded that the effects of key labor and material inputs are very small relative to the productive capacity of supplying industries, and that current and projected future slack capacity in these industries is sufficiently great to accommodate the labor and materials requirements created by the proposed change. As a result, no inflationary pressures on wages or prices are expected to be created through enactment of the proposed regulation.

INTRODUCTION

The proposed regulation being evaluated would mandate noise reductions on large commercial airplanes by December 1984. this would be accomplished in various ways: by replacement of existing aircraft with new aircraft that would meet the noise standards, by modification of engines on existing aircraft, or by a combination of the two policies.

This report analyzes the effects of the proposed program relative to a "base case," i.e., a projection of the stock of aircraft (by type) which would be anticipated in the absence of the proposed noise regulations. Three alternative cases are considered, one involving modifications only, and two modification/replacement programs. All of the sets of projections (including the base case) include some new technology aircraft (NTA), vehicles designed in part to meet anticipated noise reduction standards.

This study concentrates on the years 1981-1986. While aircraft production will obviously take place before and after this period, the six years carry the brunt of change stemming from the modification/replacement programs. (The fact that the regulation requires total compliance by December 1984 does not abrogate the findings of this study which was conducted utilizing a December 1986 compliance schedule.)

MEASUREMENT OF INFLATIONARY IMPACT

Inflation is a general increase in prices for the same quality of goods and services; the typical cause is an increase in demand at a faster rate than the supply of resources or finished goods. An increase in demand may be monetary -- i.e., generated by an expansion of the money supply -- or it may be an increase in the real demand for selective goods and services.

Inflation that is based on monetary causes is likely to be more widespread and can result in a cycle that feeds upon itself to generate further price increases over a number of years. Inflation that is based on localized increases in real demand is less likely to lead to widespread price increases, and, in many cases, the effects are dampened by offsetting reductions in the demand for goods and services. Dampening is typically the case if total demand is not increased; if total demand increases, but remains less than the capacity of a full-employment economy, the spread of price increases is also limited.

Besides an increase in demand relative to supply, inflation can be caused by an increase in real costs or decrease in supply. For example, an increase in imported energy prices or a sudden cutoff in energy imports can trigger inflation.

Increases in real demand for selective goods and services will not be inflationary if this demand is met by employing previously idle resources; in this case, the supply of the relevant goods and services at existing prices is increased to keep step with demand and, as a result, there is no inflationary effect on prices. In practice, specific imbalances between demand and supply and frictions in making adjustments will lead to some inflationary impact from demand increases in spite of the existence of idle resources; however, the inflationary potential is severely limited.

The program being evaluated will not result in monetary expansion but will cause increases in the demand for selective goods and services and will have some minor inflationary impact. However, the total program's inflationary impact will tend to be self-adjusting and short-term in nature, especially in view of the projected less-than-full-employment economy over the next few years.

In view of these conditions, the inflationary impact of the program will be evaluated by calculating the significance of increases in the demand for the output of specific industries. Three cases are explored, each corresponding to a particular set of assumptions concerning industry responses. All estimates developed here are based on the total cost of a particular case and the deviation of that case from the base case. In this way we can estimate in the next sections the maximum, incremental impact of the program.

UNIT COST ESTIMATES

The base case and three alternative scenarios are given in the following tables. Table 1A gives the number of aircraft ("FAR") produced in the indicated years. Tables 1B, 1C, and 1D give the difference in the number of aircraft produced between the case in question and the base case, and the number of aircraft modified ("RTF") in each case.

Table 2A gives the cost (in millions of 1976 dollars) of the base case, and Tables 2B, 2C, and 2D give the cost of corresponding table entries of Tables 1B, 1C, and 1D. The following schedule of costs and prices are used. 1/

	Plane price	Modification price (per plane)		
NTA	$23 million	727		$0.225 million
L-1011/DC-10	$25.9 million	707	Case 2:	2.6 million
			Case 1:	1.9 million
727	$10 million	747		$0.25 million
DC-9/737	$6.5 million	DC-9/737		$0.27 million
707	$14.7 million			
747	$32.7 million			

A range of prices is shown for the B-707 since the cost of modifying that equipment is reported to be dependent upon the number of B-707s being modified.

The total cost for each case (as opposed to the incremental cost above baseline) are furnished for reference in Table 3.

1/ Based on discussions with industry, the Mitre Corporation, and an FAA memorandum.

TABLE 1A.-BASE CASE NUMBER OF AIRPLANES PRODUCED AND MODIFIED, 1977-1986

		77-80	81	82	83	84	85	86
B747	FAR	26	14	14	14	14	14	14
	RTF	0	0	0	0	0	0	0
DC10/ L1011	FAR	58	39	40	41	43	34	33
	RTF	0	0	0	0	0	0	0
B707/ DC8	FAR	0	0	0	0	0	0	0
	RTF	0	0	0	0	0	0	0
NTA	FAR	0	0	0	0	0	58	54
	RTF	0	0	0	0	0	0	0
B727	FAR	179	9	40	28	38	0	0
	RTF	0	0	0	0	0	0	0
B737/ DC9	FAR	244	86	68	51	57	58	63
	RTF	0	0	0	0	0	0	0

TABLE 1B.-CASE 1: ONE-HUNDRED PERCENT MODIFY--
DIFFERENCE IN NUMBER OF AIRCRAFT PRODUCED AND MODIFIED
BETWEEN CASE 1 AND THE BASE CASE

		77-80	81	82	83	84	85	86
B747	FAR RTF	-10 8	0 7	0 7	0 6	0 7	0 7	0 3
DC10/ L1011	FAR RTF	0 0	0 0	0 0	0 0	0 0	0 0	0 0
B707/ DC8	FAR RTF	0 10	0 66	0 65	0 55	0 50	0 0	0 0
NTA	FAR RTF	0 0	0 0	0 0	0 0	0 0	0 0	0 0
B727	FAR RTF	0 205	0 117	0 117	0 4	0 4	0 4	0 3
B737/ DC9	FAR RTF	244 227	0 34	0 51	0 50	0 67	0 58	0 54

TABLE 1C.-CASE 2: MODIFY JT-3D AND JT-8D ENGINES--
DIFFERENCE IN NUMBER OF PLANES MODIFIED AND PRODUCED
BETWEEN CASE 2 AND BASE CASE

		77-80	81	82	83	84	85	86
B747	FAR	0	0	0	0	0	0	0
	RTF	8	12	11	4	3	3	0
DC10/ L1011	FAR	-11	-11	-1	-13	-15	-10	0
	RTF	0	0	0	0	0	0	0
B707/ DC8	FAR	0	0	0	0	0	0	0
	RTF	10	14	30	20	16	0	0
NTA	FAR	0	43	43	97	94	31	-7
	RTF	0	0	0	0	0	0	0
B727	FAR	-112	-3	-3	-28	-38	0	0
	RTF	205	117	117	0	0	0	0
B737/ DC9	FAR	0	0	0	0	0	0	0
	RTF	172	130	139	2	2	2	1

TABLE 1D.-CASE 3: REPLACE JT-3D ENGINES AND MODIFY JT-8D ENGINES -- DIFFERENCE IN NUMBER OF PLANES PRODUCED AND MODIFIED BETWEEN CASE 3 AND BASE CASE

		77-80	81	82	83	84	85	86
B747	FAR	0	0	0	0	0	0	0
	RTF	8	12	11	4	4	3	3
DC10/	FAR	-11	-11	-1	-13	-15	-10	0
L1011	RTF	0	0	0	0	0	0	0
B707/	FAR	0	0	0	0	0	0	0
DC8	RTF	0	0	0	0	0	0	0
NTA	FAR	0	43	43	97	94	31	2
	RTF	0	0	0	0	0	0	0
B727	FAR	-112	-3	-3	-28	-38	0	0
	RTF	205	117	117	4	4	4	3
B737/	FAR	0	0	0	0	0	0	0
DC9	RTF	172	30	139	2	2	2	1

TABLE 2A.-COST OF BASE CASE

(Millions of 1976 Dollars)

		1977-1980	1981	1982	1983	1984	1985	1986
B747	FAR	850.2	457.8	457.8	457.8	457.8	457.8	457.8
	RTF	00.0	0.0	0.0	0.0	0.0	0.0	0.0
DC10/ L1011	FAR	1502.2	1010.1	1036.0	1061.9	1113.7	880.6	854.7
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B707/ DC8	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NTA	FAR	0.0	0.0	0.0	0.0	0.0	1334.0	1242.0
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	FAR	1790.0	90.0	400.0	280.0	380.0	0.0	0.0
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B737/ DC9	FAR	409.5	559.0	442.0	331.5	370.5	377.0	409.5
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	TOTAL	4551.9	2116.9	2335.8	2131.2	2322.0	3049.4	2964.0

TABLE 2B.-DIFFERENCE BETWEEN CASE 1 AND BASE CASE
(Millions of 1976 Dollars)

		1977-1980	1981	1982	1983	1984	1985	1986
B747	FAR	-327.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	2.0	1.75	1.75	1.50	1.75	1.75	0.75
DC10/ L1011	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B707/ DC8	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	19.0	125.4	123.5	104.5	95.0	0.0	0.0
NTA	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	46.125	26.325	26.325	0.9	0.9	0.9	0.675
B737/ DC9	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	61.29	9.18	13.77	13.5	18.09	15.66	14.58
	TOTAL	-198.59	162.655	165.345	120.4	115.74	18.31	16.005

TABLE 2C.-DIFFERENCE BETWEEN CASE 2 AND BASE CASE
(Millions of 1976 Dollars)

		1977-1980	1981	1982	1983	1984	1985	1986
B747	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RTF	2.0	3.0	2.75	1.0	0.75	0.75	0.0
DC10/	FAR	-284.9	-284.9	-25.9	-336.7	-388.5	-259.0	0.0
L1011	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B707/	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC8	RTF	26.0	36.4	78.0	52.0	41.6	0.0	0.0
NTA	FAR	0.0	989.0	989.0	2231.0	2162.0	713.0	-46.0
	RTF	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	FAR	-1120.0	-30.0	-30.0	-280.0	-380.0	0.0	0.0
	RTF	46.125	26.325	26.325	0.9	0.9	0.9	0.675
B737/	FAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC9	RTF	46.44	35.1	37.53	0.54	0.54	0.54	0.27
	TOTAL	-1284.34	774.93	1077.71	1668.74	1437.83	456.19	46.945

TABLE 2D.-DIFFERENCE BETWEEN CASE 3 AND BASE CASE
(Millions of 1976 Dollars)

		1977-1980	1981	1982	1983	1984	1985	1986
B747	FAR RTF	0.0 2.0	0.0 3.0	0.0 2.75	0.0 2.0	0.0 2.0	0.0 1.75	0.0 1.75
DC10/ L1011	FAR RTF	-284.9 0.0	-284.9 0.0	-25.9 0.0	-336.7 0.0	-388.5 0.0	-259.0 0.0	0.0 0.0
B707/ DC8	FAR RTF	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
NTA	FAR RTF	0.0 0.0	989.0 0.0	989.0 0.0	2231.0 0.0	2162.0 0.0	713.0 0.0	46.0 0.0
B727	FAR RTF	-1120.0 46.125	-30.0 26.325	-30.0 26.325	-280.0 0.9	-380.0 0.9	0.0 0.9	0.0 0.675
B737/ DC9	FAR RTF	0.0 46.44	0.0 35.1	0.0 37.53	0.0 0.54	0.0 0.54	0.0 0.54	0.0 0.27
	TOTAL	-1310.34	728.53	999.71	1617.74	1397.48	457.19	48.69

TABLE 3.-TOTAL COST OF EACH CASE
(Millions of 1976 Dollars)

	1977-1980	1981	1982	1983	1984	1985	1986
Case 1	4353.3	2279.6	2501.2	2251.6	2437.7	3067.7	2980.0
Case 2	3267.6	2891.8	3413.5	3799.9	3759.8	3505.6	3010.9
Case 3	3241.6	2845.4	3335.5	3748.9	3719.5	3506.6	3012.7
Base	4551.9	2116.9	2335.8	2131.2	2322.0	3049.4	2964.0

The impact on industries which supply the aircraft manufacturing industry is examined in three steps:

1. the incremental financial impact of each case is computed (see Tables 2B-2D);

2. the year with the greatest total financial impact is selected for each case; and

3. materials requirements for the peak years thus selected are then projected and compared to overall production levels.

The first of these steps is detailed in the previous section; the last two are elaborated below.

For the "peak" years (i.e., those years with the greatest positive difference between a particular case and the base case), the calculated demand for new aircraft and modification work, and the difference between peak and base year demand, was distributed across industries that are major suppliers to the aircraft industry. This was done by use of the Bureau of Labor Statistics' (BLS) forecast of direct and indirect input requirements for the aircraft industry in 1985.[2] Table 4 gives the amount that would be demanded (in 1976 dollars) in each case's peak year. Table 5 gives the BLS projected 1980, 1982, and 1983 outputs of the industries, under a slow recovery scenario.[3]

It is immediately evident that the direct and indirect requirements for total demand in each case, for each commodity, do not exceed one-half of one percent of the forecasted outputs, except in the aircraft and machine shop industries. The percentages attributable to the difference between each case and the base are much smaller. Sample percentages are:

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[2] *U. S. Department of Labor, Bureau of Labor Statistics, The Structure of the U.S. Economy in 1980 and 1985, Bulletin #1831, 1975.*

[3] *Based on unpublished Bureau of Labor Statistics output.*

TABLE 4.-DIRECT AND INDIRECT DEMAND FOR GOODS AND SERVICES, BY PEAK YEAR

(Millions of 1976 Dollars)

Industry	Case 1		Case 2		Case 3	
	Difference Between Base and Case	Total Cost	Difference Between Base and Case	Total Cost	Difference Between Base and Case	Total Cost
30	.280	4.244	2.832	6.448	2.746	4.665
37	.236	3.580	2.388	5.439	2.316	3.934
43	.283	4.275	2.852	6.495	2.765	4.699
44	1.261	19.071	12.723	28.975	12.335	20.960
48	.188	2.848	1.899	4.327	1.841	3.129
49	1.057	15.998	10.673	24.307	10.347	17.583
50	1.675	25.360	16.919	38.531	16.402	27.873
52	.004	.066	.044	.100	.042	.072
54	.027	.409	.272	.622	.263	.449
55	1.274	19.267	12.854	29.270	12.461	21.174
56	1.301	19.691	13.137	29.915	12.735	21.641
57	1.385	20.959	13.982	31.844	13.557	23.035
61	1.372	20.752	13.846	31.528	13.421	22.807
62	2.283	34.527	23.035	52.454	22.331	37.946
67	3.330	50.382	33.612	76.543	32.585	55.372
69	1.179	17.833	11.898	27.074	11.533	19.600
70	7.694	116.389	77.649	176.827	75.278	127.919
73	.044	.649	.433	.985	.419	.713
77	.112	1.706	1.138	2.593	1.104	1.875
80	5.911	89.419	59.656	135.852	57.833	98.277
82	.360	5.436	3.627	8.258	3.515	5.975
84	22.546	341.115	227.576	518.252	220.623	374.908
88	1.766	26.725	17.830	40.603	17.286	29.373

TABLE 5.-BLS PROJECTED OUTPUT OF SELECTED INDUSTRIES

(Millions of 1976 Dollars)

		1980	1982	1983
30	Other Furniture	7,108	7,551	7,773
37	Plastic Materials and Synthetic Rubber	27,067	30,549	32,289
43	Rubber Products	20,247	21,993	22,866
44	Plastic Products	31,659	36,965	39,619
48	Misc. Stone and Clay Products	9,188	9,688	9,938
49	Blast Furnaces and Basic Steel Products	55,810	56,298	58,041
50	Iron and Steel Foundries and Forgings	17,768	18,420	18,746
52	Primary Aluminum	10,129	11,052	11,514
54	Copper Rolling and Drawing	5,017	5,254	5,367
55	Aluminum Rolling and Drawing	9,587	10,666	11,206
56	Other Non-Ferrous Rolling and Drawing	14,056	15,169	15,726
57	Miscellaneous Non-Ferrous Metal Products	4,554	4,754	4,853
61	Screw Machine Products	16,281	17,115	17,533
62	Other Fabricated Metal Products	37,068	39,500	40,715
67	Metalworking Machinery	19,190	20,361	20,946
69	General Industrial Machinery	24,808	27,201	28,498
70	Machine Shop Products	11,274	11,972	12,320
73	Service Industry Machines	18,578	20,548	21,534
77	Electric Lighting and Wiring	13,097	14,488	15,183
80	Radio, TV Transmitting, Signaling, and Detection Equipment	17,760	19,181	19,892
82	Miscellaneous Electrical Machinery	10,349	11,651	12,303
84	Aircraft	40,273	42,959	44,301
88	Professional, Scientific, and Controlling Equipment	8,915	9,488	19,974

Case	Industry[a]	Increment as Percentage of Total Output[c]	Total Demand as Percentage of Output[d]
1	50	0.009	0.138
1	80	0.031	0.466
1	70	0.064	0.972
1	84[b]	0.052	0.794
2	50	0.090	0.206
2	80	0.299	0.683
2	70	0.630	1.435
2	84[b]	0.514	1.170
3	50	0.088	0.148
3	80	0.291	0.494
3	70	0.611	1.038
3	84[b]	0.498	0.846

[a]*See Table 5 for industry codes.*

[b]*Reflects additional aircraft activity beyond directly demanded levels.*

[c]*Derived by dividing the appropriate entry in the "Difference Between Case and Base" column by projected BLS output in the case's peak year.*

[d]*Derived by dividing the appropriate total cost column entry by the case's peak year BLS predicted output.*

One possible bottleneck is the aluminum industry. High production costs, low profit margins, and heavy debts have hindered investment in that industry. Should these conditions persist, an under-supply of domestically refined aluminum might result for the entire economy.[4] While aluminum's share (in either rolling or primary aluminum) is small here (at most 0.21% of 1983 output), shortages could put pressure on prices. With this caveat aside, and the generally favorable outlook for metal producers,[5] no (serious) bottlenecks are foreseen.

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[4]*Business Week, April 12, 1976, pp. 76-78.*

[5]*Business Week, May 10, 1976, pp. 52-53.*

THE AIRCRAFT MANUFACTURING INDUSTRY

The existing excess capacity in the aerospace industry is apparent from the picture of industry production over the past thirteen years as shown in Table 7. In constant dollars, industry sales peaked in 1968 and have dropped by 37 percent for a thirteen-year low in 1975. Assuming that most of the industry capacity from the peak period is still intact, a large amount of slack capacity still exists.

Any significant increases in output between now and 1981 are expected to be in military sales and general aviation aircraft. The domestic market for transport aircraft is depressed primarily due to the severe financial problems of the airlines. This condition is expected to continue until the early 1980s, unless the airlines receive substantial outside financial help.

The worldwide market is very important to U.S. commercial transport sales and, currently, about two-thirds of transport production is being exported. The worldwide market is expected to grow faster than the U.S. market in the future, with a concurrent increase in competition from foreign manufacturers. As of today, the U.S. manufacturers are supplying over 90 percent of the worldwide commercial transport market, excluding the U.S.S.R.; however, significant competition now exists, especially from the French-German A300-B and the British BAC-11. The Soviet aircraft industry supplies virtually 100 percent of the Soviet commercial airline fleet.

Current projections by DMS, Inc. indicate relatively low worldwide markets in commercial aircraft for the next five years, with a sharp increase in the succeeding five years (1980-84). It is worthy of note that the DMS forecast has been dramatically revised upwards since a one-year earlier forecast. The latest forecast is compared with the earlier one in Table 6. The sharp change in these one-year apart projections casts doubt on their validity and perhaps indicates that the later forecast should be treated as an upper limit.

If the U.S. keeps its share of this worldwide market (an optimistic assumption), then U.S. production in the 1980-84 period can be expected to increase approximately 50 percent over current levels. This is probably an upper limit on expected demand on the

TABLE 6.-WORLD AIRCRAFT PRODUCTION FORECAST

(Millions of Dollars)

	DMS 1975 Forecast		
	1975-79	1980-84	% Change
Military aircraft	59,611	90,896	+52.5
Commercial aircraft	22,693	31,216	+37.6
Total	82,304	122,112	+48.4

	DMS 1974 Forecast		
	1974-78	1979-83	% Change
Military aircraft	50,044	58,004	+15.9
Commercial aircraft	22,825	21,760	- 4.6
Total	72,869	79,764	+ 9.4

Source: DMS, Inc. World Aircraft Forecast, 1974-83 and 1975-84, Greenwich, Conn. (copyrighted information purchased by FAA from DMS).

TABLE 7.-AEROSPACE INDUSTRY SALES

	Current Dollars	1972 Constant Dollars		
		Billions	Index	
			1960=100 100	1968=100 80
1963	20.1	28.1	100	80
1964	20.6	28.3	101	81
1965	20.7	27.9	99	79
1966	24.6	32.0	114	91
1967	27.3	34.5	123	98
1968	29.0	35.1	125	100
1969	26.1	30.1	107	86
1970	24.9	27.3	97	78
1971	22.2	23.1	82	66
1972	22.8	22.8	81	65
1973	24.8	23.4	83	67
1974	26.4	24.9	89	71
1975	28.0	22.2	79	63

Source: Aerospace Industries Association, Aerospace Facts and Figures 1976-77, pp. 12-13.

U.S. aerospace industry for purposes of analyzing industry capacity to meet the added demand postulated by the program under study. Since production has dropped 37 percent since 1968 (see Table 7) a 50 percent increase over the current base would bring production back to about 95 percent of its 1968 level in real terms.

In addition to the statistics presented above, the aircraft industry acknowledges that it was operating at about two-thirds of its preferred rate of capacity utilization in 1975.[6] Production is expected to drop even further in the 1976-80 period. Under the optimistic assumptions given above, if the U.S. can keep its share of the world market, then U.S. aircraft production should be fifty percent above current (1976) levels in the 1980-84 period, or at roughly ninety-five percent of its 1968 production capacity. Assuming that the base case is reflected already in the projected fifty percent increase, then the highest increment above the base case (that of Case 2 in 1983) would raise capacity utilization to ninety-nine percent of the 1968 levels. Thus the aircraft industry should be able to handle the additional orders (over the base case) with little or no increase in capacity. Since 1975 production was at sixty-three percent of 1968 productions, or approximately two-thirds of 1968 production, this program should fall at or within the industry's preferred capacity; new investment should be limited to normal plant and equipment investment replacement.

This analysis does not take into account the fact that there may be some imbalances in capacity in the industry and some special tooling would be needed for the new technology aircraft. Current investment by the industry in equipment is around $800 million per annum, which is about two-thirds of annual investment levels in the 1960s. In view of the current slack capacity in producer durable supplying industries, this added demand can easily be accommodated without expanding the capacity of these industries.

In summary, the proposed noise regulations would not entail any extraordinary investment outlays by the industry and cannot, in itself, be expected to have an inflationary impact on the capital equipment-producing industries.

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[6] *Survey of Current Business*, March 1976, pg. 18. The results are based on a survey of manufacturing executives in each industry.

Estimates of aggregate employment impacts of the program are detailed by two sectors: the aircraft producing industry (direct employment) and the remaining sectors of the economy (indirect employment). Two principle sources of information were utilized in deriving these estimates of labor requirements for both new aircraft purchases and the modifications to existing units. Estimates of the man-years required to manufacture selected aircraft, which were used to determine the direct labor impact of new aircraft purchases, were based on information supplied by aircraft producers. Bureau of Labor Statistics' measures of projected employment per billion dollars of delivery to final demand by input/output sector, were used to estimate the indirect employment effect of new aircraft purchases, and both the direct and indirect employment effects due to existing aircraft modifications.[7]

The employment impact was calculated for the peak year for each of the three scenarios under analysis. As before, the peak year was defined as the year with the largest difference in estimated total program expenditures (the sum of both new purchases and retrofits) between the scenario and the baseline forecasts. The employment impact is shown in Table 8A.

To calculate the direct employment impact as a result of new aircraft purchases, man-year requirements per unit of 606, 369, 185, and 544 for the B747, NTA, B727, and DC10/L1011 aircraft,[8] respectively, were applied to the difference in the number of new aircraft purchased by type between the scenario and baseline forecasts (see Table 8B for the forecast of new aircraft purchases and existing aircraft modifications under each scenario and the baseline). The direct employment impact due to the

[7] *U. S. Department of Labor, Bureau of Labor Statistics, The Structure of the U.S. Economy in 1980 and 1985, BLS Bulletin #1831, 1975.*

[8] *Employment information pertaining only to the NTA and DC10/L1011 aircraft were supplied by the aircraft manufacturers. Man-year requirements for the B747 and B727 were estimated by applying an assumed ratio of man-years/cost to the respective cost of each aircraft. The assumed man-year/cost ratio was the simple average of this ratio for the NTA and DC10/L1011 aircraft.*

aircraft modifications was estimated by applying the BLS ratio (interpolated to the peak year) of employees per billion dollars of delivery to final demand,[9] to the differential value of aircraft modifications (converted to 1963 dollars), between the scenario and the baseline. The sum of these two estimates equals the total direct employment impact of the program.

Indirect employment impacts were derived by applying the appropriate BLS employment/final demand ratio to the differential values of both new aircraft purchases and existing aircraft modifications.

Employment impacts in terms of employee-years were also estimated for the entire period, 1977 through 1986. The estimation procedure was identical to that described above except that the BLS employment ratios derived for 1982 (the midpoint of the time period) were used for the entire period rather than different figures for each year. The quantitative results are shown in Table 8B.

TABLE 8A.-PEAK YEAR EMPLOYMENT IMPACT
(Number of Employees)

	Peak Year	Direct Employment	Indirect Employment	Total
Case 1	1982	2,283	2,344	4,627
Case 2	1983	24,252	22,926	47,178
Case 3	1983	23,586	22,225	45,811

[9] *The BLS ratios for 1970 and 1985 are found on pages 255 and 343 of BLS Bulletin #1831, op. cit. The ratios were linearly interpolated to correspond to the appropriate peak year, 1982 for Case 1 and 1983 for Cases 2 and 3. The estimated ratios were as follows:*

	1982	1983
Direct employment per billion dollars of delivery to final demand	28,046	26,526
Indirect employment per billion dollars of delivery to final demand	28,789	27,903

TABLE 8B - EMPLOYMENT IMPACT, 1977-1986

(Number of Employee-Years)

	Direct Employment	Indirect Employment	Total
Case 1	3,977	5,668	9,645
Case 2	56,620	59,215	112,835
Case 3	50,457	55,969	106,153

Employment in the aerospace industry over the past thirteen years is shown in Table 9. Overall employment has decreased approximately 37 percent since the peak in 1968. The decrease for the airframe and aircraft parts components of the total aerospace industry is even larger than that for the whole industry, a decline of 46 percent since 1968. Highly skilled scientists and engineers account for about 7 percent of total employment in the industry and their number has decreased by 34 percent since 1968. Scientists and engineers in the aerospace industry now account for only about 19 percent of the total in all industries, constrated with 27 percent in 1968. 10/

Employment in the aerospace industry was expected to drop to the 900,000 level by the end of 1976 because of the slackening of demand for commercial jetliners, the continuing erosion of the high technology manpower base, and a relatively low level of federal commitment to new or replacement military aircraft. 11/

It can be seen from Table 9 that the maximum increase in employment in the aerospace industry, about 24,000 workers, resulting from a combination of aircraft replacements and modifications (Case 2), amounts to only a small fraction of the drop of employment in recent years and only 2.5 percent of current total employment. Thus the program, in itself, would increase demand in the labor market only slightly and therefore should have virtually no inflationary impact on wages and salaries.

10/ Aerospace Research Center employment survey as quoted in Aerospace Facts and Figures 76/77, pg. 120.

11/ Ibid., pg. 117.

TABLE 9.-EMPLOYMENT IN THE AEROSPACE INDUSTRY

	Total Industry		Scientists & Engineers		Aircraft and Parts Production Workers Only	
	(000)	Index 1968=100	(000)	Index 1968=100	(000)	Index 1968=100
1968	1,502	100	101	100	506	100
1969	1,402	93	100	99	464	92
1970	1,166	78	93	92	369	73
1971	951	63	78	77	285	56
1972	922	61	71	70	271	54
1973	948	63	72	71	281	56
1974	965	64	71	70	291	58
1975	942	63	67	66	273	54

Source: Aerospace Industries Association, Aerospace Facts and Figures, 1976-77.

The effect of the program when combined with other projected increases in output in the 1980-85 period should be examined. The most recent BLS projections of industry output[12] show an expected increase in constant dollar domestic output on the order of 50 and 70 percent for 1980 and 1985, respectively, over the 1972 level. Assuming that employment increases proportionally with output, this could mean employment of an additional 140,000-190,000 workers in the aircraft and parts component of the industry. Even by allocating 100 percent of the direct employment impact of the program (24,000 employees) to the production workers segment of the industry, maximum employment would total 435,000-485,000 workers -- still below the 1968 peak of over 500,000. The required skills are not currently in short supply and there is ample time for training new workers as necessary before increased production would start in the early 1980s. Therefore, this expansion in employment should easily be accommodated by the labor market, and no significant inflationary impact on wages and salaries can be expected.

[12] *U. S. Department of Labor, Bureau of Labor Statistics, unpublished data.*

CONCLUSION

The proposed regulation to require commercial jets to meet noise standards by December 1984 should not produce an inflationary impact on the nation's economy, in the sense of forcing price increases, of supplying industries' goods, or through large incremental demands for these industries' products. Based on U.S. Bureau of Labor Statistics' projections of industry outputs in the 1980s and BLS input/output total direct and indirect relationships, the difference between each case and the base case will add relatively little demand (in most cases less than one half of one percent) to the project supplying industries' output in any year. The total cost of each case will create additional direct and indirect demands on the supplying industries of 1.5 percent or less of projected output in any year (outside of the aircraft industry). It appears that shop industries would experience the greatest percentage increase in demand.

The modification and replacement programs will, at most, raise industry output to its peak 1968 levels. Given the current slack in the aircraft industry, it is not anticipated that inflationary pressures due to any additional net investment will occur.

Additional employment will amount to at most 112,000 employee-years over the period 1980-1986. This will be below 1968 peak year employment. It is anticipated that there will not be an inflationary impact on labor workers. Also, there should not be pressure on wages in particular professional or labor occupation groups, given the slackness in the aircraft industry over the past several years.

APPENDIX D: ANALYSIS OF THE COSTS AND BENEFITS OF THE REGULATION

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I. INTRODUCTION

A. Background

This is an analysis of the benefits and costs of enacting a regulation which requires all civil subsonic turbojet-engine powered airplanes over over 75,000 pounds maximum weight to comply with the noise levels in Federal Aviation Regulation Part 36 (FAR 36).

As of December 31, 1975, 77 percent of the U.S. fleet did not comply with the noise limits of FAR 36. These airplanes must be either retired, sold or modified to comply with the noise limits of FAR 36. The B-747, B-727, B-737 and DC-9 airplanes which do not now comply are expected to be modified except for those which are projected to be retired because they have reached their economical age limit before their compliance deadline. The pure jet B-720s, B-707s, CV-990s and DC-8s are expected to be retired or sold before their compliance deadlines. The other B-707s and DC-8s (turbofan powered) may be retired, sold or modified.

If the turbofan powered DC-8s and B-707s are retired or sold earlier than is currently projected, then a new generation of quieter, more efficient airplanes will be introduced in large quantities as replacements for these B-707s and DC-8s. The only replacement airplanes available today are the B-727-200, B-747, DC-10, L-1011 and A-400. With respect to future needs, manufacturers are now considering two types of new "low noise" airplanes for production. These include: new technology aircraft such as the Boeing 7X7 and new technology/derivative aircraft such as the Douglas DC-X-200 designed to meet the generally stricter noise standards for NPRM 75-37. Upon receipt of orders, it is estimated that these aircraft can be produced within four years.

B. Analysis Approach

Forecasts of future benefits and costs associated with the Operating Noise Limits depend on projections of future fleet composition. Table 1 contains a Base Case. The Base Case contains projections of the future composition of the fleet assuming no government action to require the current fleet to comply with the noise limits of FAR 36. These projections are the result of an evaluation of the current intentions of the aerospace industry and airline managements.

TABLE 1A

PROJECTED U.S. AIR CARRIER FLEET

(at end of indicated year)

BASE CASE

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	45	45	45	45	45	45	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	275	314	354	395	438	472	505	539	572	606	639	939
B-707, DC-8 & B-720	N	487	400	395	391	369	346	314	292	270	248	227	212	0
B-727	C	248	427	436	476	504	542	542	542	542	542	542	542	542
	N	572	500	479	459	438	418	397	376	355	335	314	293	8
	TOTAL	820	927	915	935	942	960	939	918	897	877	856	835	550
B-737 & DC-9	C	59	303	389	457	508	565	623	686	765	815	866	916	1376
	N	480	463	456	448	441	433	426	421	415	410	404	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	0	0	0	0	58	112	165	196	228	259	574

*STATUS CODES:
M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

TABLE 1B

PROJECTED U.S. AIR CARRIER FLEET (continued)

(end of indicated year)

CASE 1: 100% MODIFY

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	37	30	23	17	10	3	0	0	0	0	0	0
	M	0	8	15	22	28	35	42	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	275	314	354	395	438	472	505	539	572	606	639	939
B-707, DC-8 & B-720	N	487	390	319	250	173	100	50	22	0	0	0	0	0
	M	0	10	76	141	196	246	246	270	270	248	227	212	0
	TOTAL	487	400	395	391	369	346	296	292	270	248	227	212	0
B-727	C	248	427	436	476	504	542	542	542	542	542	542	542	542
	N	572	295	157	20	0	0	0	0	0	0	0	0	0
	M	0	205	322	439	438	418	397	380	358	337	314	293	8
	TOTAL	820	927	915	935	942	960	939	918	897	877	856	835	550
B-737 & DC-9	C	59	303	389	457	508	565	623	686	764	815	865	916	1376
	N	480	291	154	7	0	0	0	0	0	0	0	0	0
	M	0	172	302	441	441	433	426	421	416	410	405	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	0	0	0	0	58	112	165	196	228	259	574

*STATUS CODES:
- M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
- C = Other aircraft which comply with the noise levels of FAR Part 36.
- N = Aircraft which do not comply with the noise levels of FAR Part 36.

NOTE: The above projected schedule indicates airplanes remaining in status category N beyond the 12-31-84 ultimate compliance date. The difference, however, does not significantly impact the subsequent conclusions concerning the benefits, costs, or the related analyses predicated on these projections.

TABLE 1C

PROJECTED U.S. AIR CARRIER FLEET (continued)

(end of indicated year)

CASE 2: RETROFIT/MODIFY JT-3D AND MODIFY JT-8D

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	37	25	14	10	6	3	0	0	0	0	0	0
	M	0	8	20	31	35	39	42	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	264	302	341	369	397	421	454	488	521	555	588	888
B-707, DC-8 & B-720	N	498	444	360	270	160	60	30	10	0	0	0	0	0
	M	0	10	34	64	84	100	100	100	100	100	100	100	0
	TOTAL	498	454	394	334	244	160	130	110	100	100	100	100	0
B-727	C	248	380	386	423	395	334	334	334	334	334	334	334	334
	N	572	295	157	20	0	0	0	0	0	0	0	0	0
	M	0	205	322	439	438	418	397	380	358	337	314	293	8
	TOTAL	820	880	865	872	833	752	731	714	692	671	648	627	342
B-737 & DC-9	C	59	303	389	457	508	565	623	686	764	815	865	916	1376
	N	480	291	154	7	0	0	0	0	0	0	0	0	0
	M	0	172	302	441	441	433	426	421	416	410	405	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	43	86	183	277	366	422	473	490	516	534	779

***STATUS CODES:**
M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

NOTE: The above projected schedule indicates airplanes remaining in status category N beyond the 12-31-84 ultimate compliance date. The difference, however, does not significantly impact the subsequent conclusions concerning the benefits, costs, or the related analyses predicated on these projections.

TABLE 1D

PROJECTED U.S. AIR CARRIER FLEET (continued)

(end of indicated year)

CASE 3: REPLACE JT-3D AND MODIFY JT-8D

Aircraft Type	Status*	1976	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
B-747	C	59	85	99	113	127	141	155	169	183	197	211	225	400
	N	45	37	25	14	10	6	3	0	0	0	0	0	0
	M	0	8	20	31	35	39	42	45	45	45	45	45	45
	TOTAL	104	130	144	158	172	186	200	214	228	242	256	270	445
DC-10 & L-1011	C	217	264	302	341	369	397	421	454	488	521	555	588	888
B-707, DC-8 & B-720	N	497	454	394	334	244	154	98	10	0	0	0	0	0
B-727	C	248	381	387	424	396	335	334	334	334	334	334	334	334
	N	572	295	157	20	0	0	0	0	0	0	0	0	0
	M	0	205	322	439	438	418	397	380	358	337	314	293	8
	TOTAL	820	881	866	873	834	753	731	714	692	671	648	627	342
B-737 & DC-9	C	59	303	389	457	508	565	623	686	764	815	865	916	1376
	N	480	291	154	7	0	0	0	0	0	0	0	0	0
	M	0	172	302	441	441	433	426	421	416	410	405	399	269
	TOTAL	539	766	845	905	949	998	1049	1107	1180	1225	1270	1315	1645
New Technology	C	0	0	43	86	183	281	435	503	545	567	588	606	782

*STATUS CODES: M = Modified to comply with the noise levels of FAR Part 36 after December 31, 1976.
C = Other aircraft which comply with the noise levels of FAR Part 36.
N = Aircraft which do not comply with the noise levels of FAR Part 36.

NOTE: The above projected schedule indicates airplanes remaining in status category N beyond the 12-31-84 ultimate compliance date. This difference, however, does not significant impact the subsequent conclusions concerning the benefits, costs, or the related analyses predicated on these projections.

Table 1 also displays three possible industry responses to the Operating Noise Limits. In all three cases, the two- and three-engine aircraft (powered by JT-8D engines) together with the B-747s are projected to be modified to achieve compliances, and the pure jet B-720s, B-707s and DC-8 are projected to be retired or sold. These three cases differ in the disposition of turbofan jet B-707s and DC-8s: Case 1, 100% Modify, assumes they are all modified to achieve compliance; Case 2, Modify/Replace JT-3D and Modify JT-8D assumes that 100 of the B-707s and DC-8s (powered by JT-3D engines) are modified and the remainder are retired or sold; Case 3, Replace JT-3D and Modify JT-8D, assumes that none of the JT-3D airplanes are modified. These three cases span the range of possible industry reaction to these Fleet Noise Limits.

The introduction of New Technology airplanes in Cases 2 and 3 occurs four years sooner than in the other two cases. In Cases 2 and 3, it is assumed that the air carriers decide to replace substantial numbers of B-707s and DC-8s before 1985. The resulting demand for new aircraft is anticipated to be adequate to assure first deliveries of New Technology airplanes in 1981. In the absence of this demand, these New Technology airplanes are not expected to come into service until 1985. As a result, the numbers of New Technology airplanes projected to be in the fleet in 1995 are much higher in the two cases in which B-707s and DC-8s are replaced than in the Base Case and the 100% Modify Case. The numbers of B-727s from 1981 to 1995 are correspondingly decreased in the two replacement cases.

It was assumed that passenger demand would be increasing at an annual rate of six percent. The aircraft that will be required to serve this increased demand are an important factor in the fleet projections shown on Table 1. If government noise reduction action results in substantial early fleet replacement, it is likely that the development date of New Technology aircraft will be accelerated. In these cases, a benefit results from being able to purchase advanced technology aircraft at an earlier date as a means of meeting growth in demand.

II. CONCLUSIONS

The Operating Noise Limits will reduce the number of people residing in areas of significant airplane noise annoyance by at least 800,000 people in 1985. This number would increase to over two million people if the airlines elect to replace rather than modify their turbofan powered B-707 and DC-8 airplanes. The present value in 1975 of these benefits from the public prespective is estimated to be $1.2 billion if the industry rejects the replacement option and $3.7 billion if the industry elects to replace all but 100 of their turbofan powered B-707 and DC-8 airplanes.

The estimated costs of the regulation are only one-third as large as the estimated benefits in the most pessimistic case considered, Case 1: 100% Modify. In this case the 1975 present value costs of the Operating Noise Limits are $440 million from the public prespective (before taxes at a 10% discount rate after accounting for inflation). However it has not been possible to predict how the industry will choose to bring their fleets into compliance. If they elect to replace rather than modify their JT-3D fleets (Case 3) there will be a $350 million benefit from the public perspective rather than a $440 million cost.

The cost of compliance is shown to be less than 10% of the total fleet costs of the airlines, and possibly less than 5% depending on the replacement policies adopted by the airlines (using after tax present value costs with a 15% discount rate). However, the cost differences between the cases were too small in this aggregate analysis to predict the replacement policies of each of the airlines.

The net present value of incremental sales (relative to the Base Case at 10% discount rate) to the aerospace industry were found to be increases of approximately $1.5 billion and $1.7 billion for Cases 2 and 3 respectively as opposed to a sales increase of only $0.3 billion for Case 1, 100% Modify. The increases in sales in Cases 2 and 3 result from the accelerated purchases of New Technology airplanes. Incremental direct employment in the aircraft manufacturing industry resulting from the purchase and modification of airplanes to comply with the Operating Noise Limits was estimated to be 4,000, 54,000 and 50,000 job years for Cases 1, 2 and 3 respectively between 1977 and 1986. In addition, a significant amount of indirect employment would be created in industries providing the inputs to the aerospace industry. This gain in employment represents only a small percentage of projected overall employment in the aerospace industry.

Replacement or combination modification/replacement would provide savings of approximately 5 billion gallons or 3 billion gallons of fuel over a 20 year period. Complete modification would result in additional fuel consumption of approximately 0.3 billion gallons of fuel over the period. These changes in fuel consumption are a small percentage of the two to three hundred billions of commercial aviation fuel consumption predicted for this 20 year period. In addition to the effect on airline operations, some portion of the savings associated with replacement can be throught of as being invested directly into U.S. technology development rather than lost in foreign exchange by the purchase of mid-East oil. Additional savings also will result from a currently unincorporated shadow price associated with regulatory control and other distortions of free market oil prices.

Although not quantified, replacement can be expected to be beneficial in terms of U.S. technological leadership, sales in growth markets, and export sales. New technology is introduced more quickly into the U.S. fleet and provides more efficient and less costly air travel. New and derivative designs can be expected to lead to additional exports.

III. METHODOLOGY

A. Scope

The emphasis of this analysis is on the benefits and costs that a government-initiated, aircraft modification/ replacement program would have to the airline industry relative to a normal attrition situation without acoustical modification (baseline). Capital costs and operating costs, in constant dollars, were compared to the baseline case, for a range of cases. Net present values were calculated both before and after taxes. This financial analysis was performed since, aside from the environmental (noise) benefits which the program is directed at achieving, the airlines are the most directly impacted parties.

Secondarily, the Operating Noise Limits should lead the aerospace manufacturing industry to accelerate development of new technology aircraft, stimulus of sales, and increased employment. The significance of the program to the aerospace industry as a whole is considered to be substantially less than it is to the airline industry. Accordingly, the analysis simply compared net sales values for each of the scenarios in order to achieve better understanding of the impact to the industry of the possible outcomes resulting from adoption of the policy. Estimates of added employment under policy enactment were made for the same purpose and are discussed in Section IV-B. Finally, estimates of noise benefits in terms of the effect upon residential property values and annoyance were made in order to establish levels of benefits over the range of cases analyzed.

B. Airline Factors

In performing the airline analyses, costs were divided into capital costs and operating costs. Economic rather than accounting, cost definitions were used. Capital costs of aircraft purchase, sale, and modification were included in the analysis with due regard to progress payments, investment tax credits, depreciation tax considerations, and taxes on recaptured depreciation. The operating cost analysis, which was conducted both before and after taxes only used out-of-pocket items such as fuel and direct maintenance. The increased maintenance costs of B-707/DC-8 aircraft as they approach their terminal age and increases in fuel prices were incorporated in these analyses.

The final calculations made no assumptions about the availability of government financial assistance, assumed that tax credits could be utilized, and assumed that all new aircraft would be purchased rather than leased. By looking only at costs, it was recognized that prediction of fare/revenue changes associated with the different cases is impossible.

Sensitivity Analysis

In order to investigate the stability of the conclusions, several parameters were varied: fuel price, discount rate, and purchase price of advanced technology aircraft.

Fuel price was assumed to increase at annual rates of 0%, 6%, and 12% in constant dollars. Inflation adjusted discount rates ranged from 10% to 25% in 5% increments. A rate of 10%, which is reflective of the U.S. economy as a whole, is suggested in OMB Circular A-94. A rate of 15% is a more appropriate value for the airline industry. The analyses used purchase prices for advanced technology aircraft of $20 million, $23 million, and $26 million in 1975 dollars.

IV. IMPACT OF POLICY ADOPTION

A. Airlines

Since the introduction of DC-10/L-1011 aircraft, the newest aircraft in U.S. use today, there have been substantial developments in aircraft design technology. This technology is capable of producing a new generation of highly productive and quiet jet transport aircraft. However, the financial situation of the airline industry is such that manufacturers are unable to obtain enough purchase commitments to justify starting production. The extension of FAR 36 noise limits is expected to accelerate the orders for a new type of aircraft and, hence, the implementation of this pending technology.

There are several examples of pending technology which are likely to be implemented in new aircraft type designs. First is the introduction of the high bypass turbofan technology in the ten-ton engine size category. The high bypass technology, now in use with the larger family of aircraft using the twenty-ton engines, has already been demonstrated to produce 12-15% reductions in fuel comsumption and improved noise levels. Second, new but unused technology in aerodynamic efficiency (such as the super-critical wing) offers an opportunity for additional fuel savings. Third, new "composite" materials technology offers the promise of reduced airframe weights, lower production costs, and ease of maintenance. The lower weight has, of course, an impact on lowering the fuel required. Thus, improvements in both aerodynamics and materials are expected to contribute some 10-15% to fuel reduction in New Technology aircraft.

The fourth significant new technology involves the use of microelectronics -- another area in which American technology leads the world. In this case, the savings in weight is not as significant as the reduction in cost.

As modern aircraft become increasingly complex, that fraction of production cost devoted to electronics has steadily risen. With the new developments now being demonstrated in various military applications, it is clear that both capital and maintenance costs can be reduced to improve return on investment.

Cash flow streams were determined by examining operating costs and capital costs for vehicle acquisition and/or modification for each of the scenarios relative to the baseline. The comparative results are shown in Table 2.

The positive benefit associated with replacement is the results of the increased efficiency of the New Technology airplanes. Fuel savings are the dominant aspect of this increase in efficiency. Maintenance and crew costs savings are also expected.

In Case 1, 100% Modification, the negative net benefit to the airlines relative to the baseline is the result of an approximately 1% increase in out-of-pocket costs. This increase in out-of-pocket costs is due primarily to the approximately 15% fuel penalty from the additional weight added to the aircraft in order to effect the noise reductions.

TABLE 2

BEFORE TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)

Case	Net Present Value at 10% Discount Rate
100% Modified	439
Modify/Replace JT-3D and Modify JT-8D	228
Replace JT-3D and Modify JT-8D	-352

AFTER TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)

Case	Net Present Value at 15% Discount Rate
100% Modified	200
Modify/Replace JT-3D and Modify JT-8D	427
Replace JT-3D and Modify JT-8D	293

Note: All cases presume a purchase price of $23 million for new technology aircraft and a 6% annual increase in fuel prices after inflation. Positive net present values represent additional costs relative to the base case and negative net present values represent benefits relative to the base case.

A description of the costs and schedules used to develop the figures in Table 2 is contained in Attachment 2. This attachment also contains the results of alternative assumptions about airplane costs, and discount rates.

B. Aerospace Industry

This regulation will effect the aerospace industry in sales and employment. These effects are examined in the following sections.

1. Net Present Value of Sales

In each of the cases analyzed, the domestic aircraft purchase of U.S manufactured aircraft over a 20-year period would be approximately $6 - 8 billion (in 1975 dollars). The replacement options would primarily shift purchases of advanced technology to earlier dates.

The cash flow to the manufacturers is basically equal to the net cash flow from the airlines for capital expenditures. They differ to the extent of B-707/DC-8 aircraft sales by the airlines. This is because these aircraft would presummably be sold on the open aircraft market and would probably not be retained by the manufacturers. The following table shows for each alternative relative to the baseline case the net present value (at a 10% discount rate) of the cash flow streams to the manufacturers based on the fleet mix and modification assumptions detailed in Table 1 and Table B-1.

Case	Net Present Value of Sales Increase ($ Millions)*
100% Modify	295
Modify/Replace JT-3D and Modify JT-8D	1490
Replace JT-3D and Modify JT-8D	1700

The above table shows that under the alternative of 100% modification the industry would be subject to a degraded* cash flow stream, compared to the two other alternatives. This occurs primarily because replacement of the B-707/DC-8s is delayed relative to the other cases. The two replacement options would be beneficial to the manufacturers and would have substantially positive net present values relative to the baseline case.

Depending on the case, the modification/replacement programs in 1981-1986 would add, at a maximum between 0.38% and 3.77% per year (above the base case) to the forecasted output of the aircraft industries (assuming the "slow recovery" scenario of the Bureau of Labor Statistics projectios). The total cost

*Relative to the baseline case

of each case, at a maximum, would amount to between 5.8% and 8.46% per year of the projected aircraft industry output. Should the economy's recovery proceed faster than in the slow BLS case, these percentages would drop.

The B-707/DC-8 replacement increment plus possible replacement of JT-8D-powered aircraft with advanced technology aircraft and foreign sales provides a boost to the industry by increasing the net present value of their sales. This is important because the timing would be such that sales would be generated in a period for which prospects would otherwise be forecast as poor.

2. Effect on Employment

Using the Bureau of Labor Statistics' measures of projected employment per billion dollars of delivery to final demand by input/output sector, 1/ along with information supplied by aircraft manufacturers on the labor requirement per unit for selected aircraft, aggregate employment effects of each of the three alternative scenarios, (measured as the derivation from the base case) were estimated. Employment estimates were derived for the year of peak demand as well as for the

1/ As reported in U.S. Department of Commerce, Bureau of Labor statistics, The Structure of the American Economy in 1980 and 1985, Bulletin #1831, 1975.

entire ten-year period, 1977-1986, and are broken down by jobs created within the aircraft producing industry (direct employment) and employment generated elsewhere in the economy (indirect employment). Nearly 113,000 new employee-years would be created over the ten-year period 1977 to 1986 as a result of combination replacement/modification program (Case 2) with the peak year calling for 24,000 employees above baseline in the aerospace industry and about 23,000 additional workers throughout the remainder of the economy. Complete replacement of the existing B-707/DC-8 fleet with the new technology aircraft (Case 3) would yield similar results: 106,000 new employee-years from 1977 through 1986 and a peak demand representing direct employment of 23,600 and indirect employment of about 22,000. A program of modifications to the entire B-707/DC-8 fleet (Case 1) would generate a peak demand of only 2,300 workers in each of the sectors while total employment over the ten-year period would reach 19,000 employee-years.

C. Noise Benefits

The noise benefits of the Operating Noise Limits have been quantified in two ways:

- Reduction in number of people exposed to a given quantity of environmental noise.
- Dollar value equivalent of the noise reduction.

A computer model called the Systems Analysis Model - Phase I was used to calculate the environmental noise impact for each case in each of the years: 1980, 1985, and 1995. The effectiveness of the Operating Noise Limits for each of three alternative industry responses relative to the base case are shown in Figures 1 and 2.

Figures 1 and 2 show a substantially better environment in the cases in which JT-3D aircraft are replaced rather than modified. This difference is due to a larger number of New Technology airplanes and a smaller number of B-727s in the fleet from 1980 to 1995.

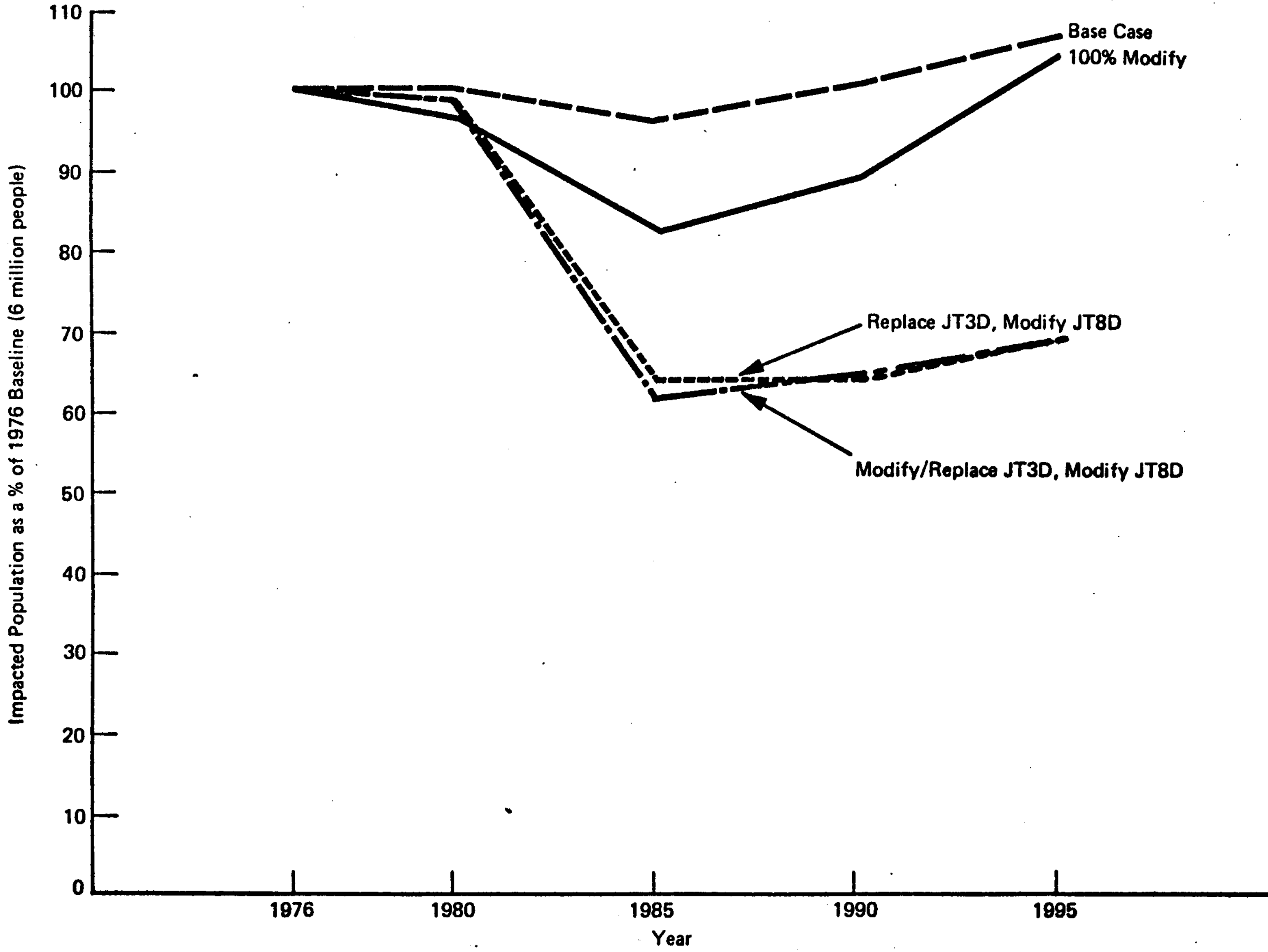
In calculating the dollar value equivalent of the noise reduction, the key parameter was the value placed on the annoyance, inconvenience, discomfort, mental distress and emotional distress suffered by the airports' neighbors. The value selected is $400 per year per person for those people residing at exposure levels expected to cause significant annoyance, NEF 30 or higher. This value is the judgment in a recent court award.

The dollar value equivalent benefits listed below include both the $400 per person per year value of annoyance mentioned above and a value placed on the transient property value increases which will result from transient reductions in the environmental noise. The methodology explained in Attachment 1 led to the following dollar equivalent benefits of the Operating Noise Limits in 1975 present value dollars:

Case 1:	100% Modify	$1.2 billion
Case 2:	Modify/Replace JT-3D and Modify JT-8D	$3.7 billion
Case 3:	Replace JT-3D and Modify JT-8D	$3.6 billion

D. Fuel Usage

Advanced technology airplanes are estimated to be nearly 30% more fuel efficient than the B-707 and DC-8 airplanes on a seat mile per gallon basis. The savings and/or losses in fuel accumulated between 1977 and 1995 for each alternative are shown in Table 3. The costs or benefits of these fuel consumption differentials have been incorporated in the economic analysis in Section IV-A.



RELATIVE EFFECTIVENESS – IMPACTED POPULATION (NEF 30)

ATTACHMENT 1

ENVIRONMENTAL BENEFITS

Present Value of Total Benefits

The estimated present values of the reductions in noise in 1975 dollars from the base case for each alternative are:

100% Modify	$1.2 billion
Modify/Replace JT-3D and Modify JT-3D	$3.7 billion
Replace JT-3D and Modify JT-3D	$3.6 billion

The present value of the total benefits is calculated using a 10% discount rate and assumes that all benefits vanish in the year 2000. Note that the combination modify/replace policy appears higher in benefits than either of the other scenarios. This is due to the fact that in relation to the other cases the fleet is quieter in the early program years. Even though the replace JT-3D case leads to a quieter fleet over the long run, the effect of determining net present value over a twenty-year period is that early benefits have greater apparent weight.

The estimated present value of the reductions in noise is the sum of two separate benefits:

- The aircraft noise around airports depresses property values. Lowering the noise levels will increase the value of these properties. The predicted increase in revenue generated by these increased property values is used as the property value measure for commercial properties. The property value measure for owner-occupied residential properties is taken to be the predicted increase in revenue generating potential of these properties.

- In addition to the increases in property values, a value is placed on the annoyance, inconvenience, discomfort, mental distress and emotional distress suffered by the airports' neighbors. The reduction in noise levels will reduce the number of people impacted. This value of the noise reduction in any year is taken to be the number of people removed from the area of significant noise impact times a per person dollar evaluation of the impact.

The values of I and R were diffcult to estimate. The value of I was selected by reviewing the literature on the effect of aircraft noise on property values. This literature is summarized in Table Al. Since the majority of the population reduction is at the big city airports, value of I selected reflects the property value sensitivity to noise at big city airports.

The value of R, the rate of return on real estate investments was selected by interviewing experts in the field. A value of 12% per year for apartment houses was judged a reliable estimate. The rate of return on investments in single family residents was less easily estimated. Experts agreed on a range of 0% to 10% in cost flow from lease or rental. However, they pointed out that property appreciation and tax shelter were the primary reasons for this type of investment. Estimates of the historical return due to appreciation during the past 10 years were on the order of 15% per year or higher. However, the experts' predictions for the future were considerably lower. A value of 7% per year was selected as a conservative value. The 8% per year value used is a weighted average of the value for apartments and the value for single family residences. The weighting factors were determined using 1970 census data given below.

Present Values of the Property Value Increases

In economic terms, the present values of the property value increases are:

100% Modify	\$ 31 million
Modify/Replace JT-3D and Modify JT-8D	\$299 million
Replace JT-3D and Modify JT-8D	\$292 million

These values were computed using a formula which assumes no benefit before 1979 or after 1999 and that property values vary linearly over five-year intervals. The formula is:

$$\sum_{k=0}^{20} R * I * P(k) * V * N(k) * 1.1^{-k-4}$$

where:

k = an index indicating the year: year = 1979 + k, e.g.,

= 0 if 1979

= 6 if 1985

= 11 if 1990

= 20 if 1999

P(k) = Reduction in the population residing within the NEF 30 contour in year k.

N(k) = Average decibel reduction in the NEF level.

V = per capita 1975 value of residential properties = \$8,676.

I = the fractional increase in property value resulting from each unit reduction in NEF = .02.

R = Rate of return on investments in residential properties per year = .08.

The per capita property value was primarily determined using 1970 census housing for SMSA's not in central cities. The rental unit value inflator was derived from the Consumer Price Index Series. The property value inflator for single family residences was derived from the National Association of Realtors, Existing Home Sales Series. The equation used to determine the per capita property value is:

$$V = \frac{MH * NH * (1+r1)^5}{PH * (NH+NR)} + \frac{MR * NR * (1+r2)^5}{PR * (NH + NR)}$$

where:

MH	= Median Housing Value	= \$20,700
PH	= People Per Unit	= 3.3
NH	= Number of Single Family Residences	= 13.6M
r1	= Single Family Residence Property Value Inflator	= 9.8%
MR	= Median Rental Unit Value (100 x Median Rent)	= \$11,300
PR	= People Per Rental Unit	= 2.4
NR	= Number of Rental Units	= 6.4M
r2	= Rental Unit Value Inflator	= 4.4%
v	= Per Capita Property Value (1975 Dollars)	

TABLE A1

SUMMARY OF AIRCRAFT NOISE ECONOMIC STUDIES

PERCENT CHANGE IN PROPERTY VALUE PER UNIT NEF CHANGE (AVERAGE)

STUDY	CITY/AIRPORT	NELSON 9/ 12/	OTHERS
McClure 1)	Los Angeles, Cal.		1.5
Colman 2)	Inglewood, Cal. (LAX)		1.5
Paik 3)	N.Y., Los Angeles, Dallas	2.1 -2.6	1.5
Emerson 4)	Minneapolis	0.4	1.2
Dygert & Sanders 5)	San Francisco		1.2 - 1.5
Dygert 6)	San Francisco	0.5	
Roskill-Heathrow 7)	Heathrow Environs		2.2
-Gatwick	Gatwick Environs		2.7
Price 8)	Boston	0.4	
Nelson 9)	Washington, D.C.	0.5 - 1.0	
DeVany 10)	Dallas		.2 - 2.1
Mieszkowski and Saper 11)	Etobicoke Mississauga (Toronto)		.8 - 1.8

TABLE A1 (continued)

1) McClure, P.T., Some Projected Effects of Jet Noise on Residential Property Near Los Angeles International Airport by 1970, Santa Monica, California: Rand Corporation, April 1969

2) Colman, A.H., Aircraft Noise Effects on Property Value, Environmental Standards Circular, City of Inglewood, California, February 1972

3) Paik, I.K., Measurement of Environmental Externality in Particular Reference to Noise, Ph.D. Dissertation, Georgetown University, 1972

4) Emerson, F.C., The Determinants of Residential Value With Special Reference to the Effects of Aircraft Nuisance and Other Environmental Features, Ph.D. Dissertation, University of Minnesota, 1969

5) Dygert, P.K., Sanders, D., On Measuring the Cost of Noise From Subsonic Aircraft, Institute of Transportation and Traffic Engineering, Monograph (Berkeley, 1972)

6) Dygert, P.K., Estimation of Cost of Aircraft Noise to Residential Activities, Ph.D. Dissertation, University of Michigan, 1973

7) Roskill Commission, Report of the Commission on the Third London Airport, (HMSO, 1971)

8) Price, I., The Social Cost of Airport Noise as Measured by Rental Changes: The Case of Logan Airport, Ph.D. Dissertation, Boston University, 1974

9) Nelson, Jon, The Effects of Mobile-Source Air and Noise Pollution on Residential Property Values, Report NO. DOT-TST-75-76, April 1975, Department of Transportation, Washington, D.C.

10) DeVany A., unpublished manuscript

11) Mieszkowski, P., Saper, A., An Estimate of the Effects of Noise on Property Values, unpublished report

12) Nelson, Jon, Aircraft Noise, Residential Property Values and Public Policy, January 1976, Draft Monograph

The reductions in population within the NEF 30 contour and the average decibel reduction within this contour were determined for 1980, 1985, 1990 and 1995 using the NEF System Model - Phase I. These values are shown on Tables A2 and A3. Table A4 shows the increases in revenue predicted to result from the decrease in noise.

The calculation assumes a 2% increase in residential property values per unit decrease in the NEF level, and an 8% year rate of return on residential property investments. Note that owners of owner occupied residences are assumed to be receiving revenue from themselves as if they were vesting to themselves.

The values for years other than those at which the model was exercised were determined by linear interpolation assuming a zero benefit in the year 1978 and 2000.

TABLE A2

NEF 30 Population Reduction (in thousands)

	1980	1985	1990	1995
100% Modify	210	810	700	140
Modify/Replace JT-3D and Modify JT-8D	100	2030	2120	2240
Replace JT-3D and Modify JT-8D	90	1930	2150	2240

TABLE A3

Reduction in NEF Value

	1980	1985	1990	1995
100% Modify	.2	.9	.8	.1
Modify/Replace JT-3D and Modify JT-8D	.1	2.6	2.6	2.6
Replace JT-3D and Modify JT-8D	.1	2.5	2.7	2.6

TABLE A4

Value of Property Value Increases

(1975 dollars in Millions)

Year	Case 1 - 100% Modify	Case 2 - Modify/Replace JT-3D and Modify JT-8D	Case 3 - Replace JT-3D and Modify JT-8D
1979	.3	.1	.1
1980	.6	.1	.1
1981	2.5	14.8	13.5
1982	4.4	29.4	26.9
1983	6.3	44.1	40.3
1984	8.2	58.7	53.7
1985	10.1	73.4	67.1
1986	9.6	74.0	69.8
1987	9.2	74.7	72.5
1988	8.7	75.3	75.2
1989	8.3	76.0	78.0
1990	7.8	76.6	80.7
1991	6.3	77.5	80.8
1992	4.8	78.4	80.8
1993	3.2	79.2	80.9
1994	1.7	80.1	80.9
1995	.2	81.0	81.0
1996	.2	64.8	64.8
1997	.1	48.6	48.6
1998	.1	32.4	32.4
1999	.0	16.2	16.2
TOTAL	92.6	1155.4	1144.3
Present value in 1975 at 10% discount rate	30.7	299.0	292.1

Present Value of Annoyance Mitigation

In addition to the increases in property values, the annoyance, inconvenience, discomfort, mental distress, and emotional distress suffered by the airports' neighbors must be considered. In a significant decision (Greater Westchester Homeowners' Association et al v. City of Los Angeles, et al.) one judge valued these personal injuries at some $400 per person per year for all residents within the CNR 100 contour. (The CNR 100 contour is approximately the same as the NEF 30 contour.) The judge in this case explicitly ruled that these personal injuries are in addition to the property value losses suffered by the airports' neighbors.

Using this judge's estimate together with our estimates of the number of people removed from the NEF 30 contour, the present values of the reductions in annoyance, inconveniences, discomfort, mental and emotional distress can be calculated:

100% Modify	$1.2 billion
Replace/Modify JT-3D and Modify JT-8D	$3.4 billion
Replace JT-3D and Modify JT-8D	$3.3 billion

The values were determined using the formula:

$$\sum_{k=0}^{20} \$400/\text{person} * P(k) * 1.1^{-k-4}$$

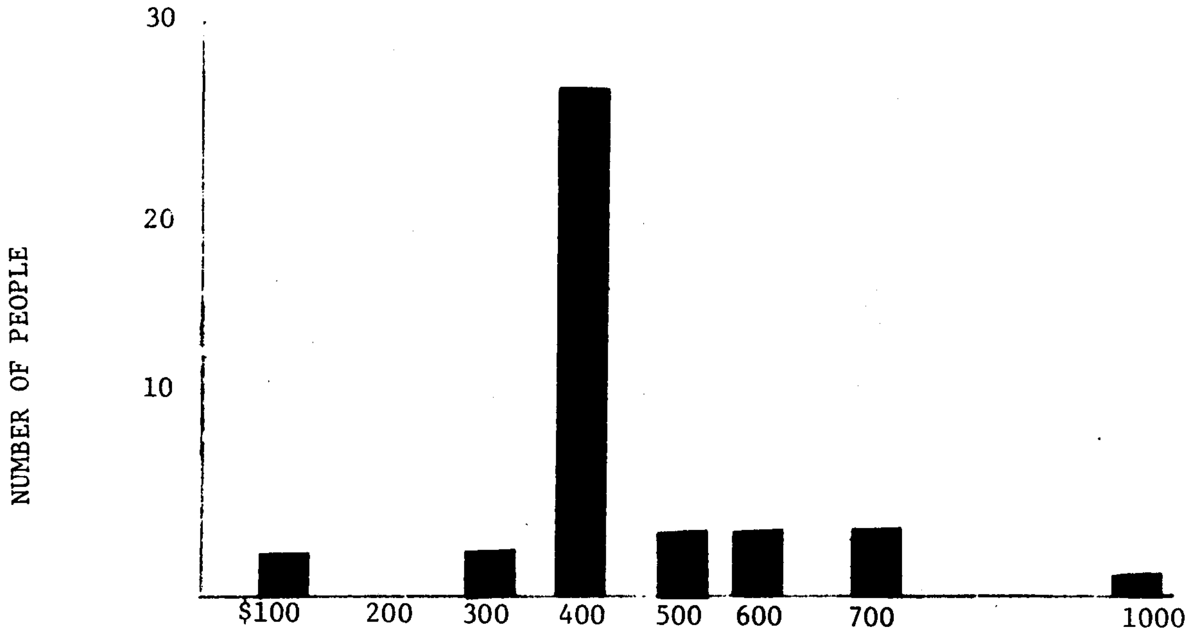
which is analogous to the formula described in the previous section.

The value of $400/person as a measure of annoyance was determined by examining a frequency distribution of the sizes of the judge's awards. This distribution is shown in Figure A1. A case-by-case analysis of the amounts of the awards suggests that the judge varied the size of the award based on individual reactions to the noise, not on the level of the noise at their residence.

Table A5 shows the values of annoyance mitigation for each year. For 1980, 1985, 1990 and 1995 the values shown were computed using the population reductions in the NEF 30 contour given in Table A2 multiplied by $400/person. For the remaining years the values were interpolated assuming zero benefits in 1978 and 2000.

Figure A1

FREQUENCY DISTRIBUTION OF PERSONAL DAMAGE AWARDS
IN GREATER WESTCHESTER HOMEOWNERS' ASSOCIATION ET AL.
V.
CITY OF LOS ANGELES ET AL.



AMOUNT OF AWARD PER PERSON PER YEAR IN 1975 DOLLARS

TABLE A5

Value of Annoyance Mitigation

(1975 dollars in Millions)

Year	Case 1 - 100% Modify	Case 2 - Modify/Replace JT-3D and Modify JT-8D	Case 3 - Replace JT-3D and Modify JT-8D
1979	42	20	18
1980	84	40	36
1981	132	194	183
1982	180	349	330
1983	228	503	478
1984	276	658	625
1985	324	812	772
1986	315	819	790
1987	306	826	807
1988	298	834	825
1989	289	841	842
1990	280	848	860
1991	235	858	867
1992	190	867	874
1993	146	877	882
1994	101	886	889
1995	56	896	896
1996	45	717	717
1997	34	538	538
1998	22	358	358
1999	11	179	179
TOTAL	3594	12920	12766
Present value in 1975 at 10% discount rate	1187	3385	3313

TABLE B-1

PRICE ASSUMPTIONS FOR CAPITAL ANALYSIS*

a) PRICE OF NEW AIRCRAFT

New Technology	\$20 Million \$23 Million \$26 Million
727	\$10 Million
DC-10	\$27 Million

b) PRICE FOR MODIFICATION (KIT PLUS AIRLINE COSTS)

B-707/DC-8	\$1.2 MILLION/VEHICLE - IF 270 AIRCRAFT MODIFIED
B-707/DC-8	\$2.6 MILLION/VEHICLE - IF 100 AIRCRAFT MODIFIED
B-727	\$0.225 MILLION/VEHICLE
B-737/DC-9	\$0.270 MILLION/VEHICLE
B-747	\$0.250 MILLION/VEHICLE

c) AVERAGE SALE PRICE OF NON-MODIFIED B-707/DC-8**

	1975-1980	1981-1985	1986-1995
NOISE RULE	\$2.5 MILLION	\$2.0 MILLION	\$1.5 MILLION
NO NOISE RULE	\$3.0 MILLION	\$2.5 MILLION	\$2.0 MILLION

*All prices in 1975 dollars.

**Add \$.5 million if modified.

TABLE B-2

BASELINE OPERATING COSTS DATA (OUT-OF-POCKET ITEMS ONLY)

AIRCRAFT TYPE	COST PER AIRCRAFT-YEAR (000)	NUMBER OF SEATS PER AIRCRAFT	ANNUAL COST PER SEAT (000)
B-707/DC-8	3,800	145	26.2
B-707/DC-8 w/ ACOUSTIC MODIFICATION	3,850	145	26.6
DC-10	5,120	250	20.5
B-727	2,780	125	22.2
New Technology	3,690	200	18.4

TABLE B-3

NUMBER OF JT-8D AND JT-9D AIRCRAFT
TO BE MODIFIED BY YEAR

YEAR	B-727	B-737/DC-9	B-747
1979	92	86	0
1980	113	86	8
1981	117	130	12
1982	117	139	11
1983	4	2	4
1984	4	2	4
1985	4	2	3
1986	3	1	3

TABLE B-4

BEFORE TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS
RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)
($20 million per New Technology aircraft)

Case	Discount Rate	Capital Costs	Operating Costs	Total Costs
100% Modified	10%	362	77	439
	15%	274	46	320
Modify/Replace JT-3D and Modify JT-8D	10%	1117	-1284	-167
	15%	880	-714	-166
Replace JT-3D and Modify JT-8D	10%	1235	-2030	-794
	15%	988	-1182	-194

AFTER TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS
RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)

Case	Discount Rate	Capital Costs	Operating Costs	Total Costs
100% Modified	10%	227	40	267
	15%	176	24	200
Modify/Replace JT-3D and Modify JT-8D	10%	660	-667	-8
	15%	594	-372	222
Replace JT-3D and Modify JT-8D	10%	715	-1055	-340
	15%	677	-615	63

Note: All cases presume a purchase price of $20 million for New Technology aircraft and a 6% annual increase in fuel prices after inflation. Positive net present values represent additional costs relative to the base case and negative net presents values represent benefits relative to the base case.

TABLE B-5

BEFORE TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS
RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)
($23 million per New Technology aircraft)

Case	Discount Rate	Capital Costs	Operating Costs	Total Costs
100% Modified	10%	362	77	439
	15%	274	46	320
Modify/Replace JT-3D and Modify JT-8D	10%	1512	-1284	228
	15%	1184	-714	469
Replace JT-3D and Modify JT-8D	10%	1678	-2030	-352
	15%	1331	-1182	149

AFTER TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS
RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)

Case	Discount Rate	Capital Costs	Operating Costs	Total Costs
100% Modified	10%	227	40	267
	15%	176	24	200
Modify/Replace JT-3D and Modify JT-8D	10%	899	-667	231
	15%	799	-372	427
Replace JT-3D and Modify JT-8D	10%	978	-1055	-78
	15%	907	-615	293

Note: All cases presume a purchase price of $23 million for New Technology aircraft and a 6% annual increase in fuel prices after inflation. Positive net present values represent additional costs relative to the base case and negative net presents values represent benefits relative to the base case.

TABLE B-6

BEFORE TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS
RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)
($26 million per New Technology aircraft)

Case	Discount Rate	Capital Costs	Operating Costs	Total Costs
100% Modified	10%	362	77	439
	15%	274	46	320
Modify/Replace JT-3D and Modify JT-8D	10%	1907	-1284	623
	15%	1487	-714	773
Replace JT-3D and Modify JT-8D	10%	2120	-2030	91
	15%	1674	-1182	492

AFTER TAX NET PRESENT VALUE OF INCREMENTAL CASH FLOWS
RELATIVE TO THE BASE CASE
1975-1995
(Millions of 1975 Dollars)

Case	Discount Rate	Capital Costs	Operating Costs	Total Costs
100% Modified	10%	227	40	267
	15%	176	24	200
Modify/Replace JT-3D and Modify JT-8D	10%	1137	-667	470
	15%	1004	-372	632
Replace JT-3D and Modify JT-8D	10%	1240	-1055	184
	15%	1137	-615	523

Note: All cases presume a purchase price of $26 million for New Technology aircraft and a 6% annual increase in fuel prices after inflation. Positive net present values represent additional costs relative to the base case and negative net presents values represent benefits relative to the base case.

APPENDIX E: SINGLE EVENT NOISE REDUCTIONS FOR AIR CARRIER JET AIRCRAFT

APPENDIX E
SINGLE EVENT NOISE REDUCTIONS FOR AIR CARRIER JET AIRCRAFT

This appendix provides graphic information concerning noise of jet aircraft in both modified and unmodified configurations. These materials were developed by the FAA as part of its analytical studies of the effects of various technological alternatives to reducing aircraft source noise.

The computations for the graphs were determined through the use of aircraft noise computer models developed by the FAA. The aircraft noise and performance information used as source data in the models was obtained from FAA reports prepared through contracts with aircraft manufacturers (See Appendix E References). Individual aircraft benefits are shown through the use of three methodologies, as follows:

a. Aircraft noise under the flight path. These graphs demonstrate changes to the noise environment expected to be perceived by observers located directly under the approach or departure flight tracks. It can be seen that a quieter environment is expected for all aircraft types through modification.

b. Contours of equal exposure to 85dBA. These graphs depict expected changes in land areas and shape within the 85dBA contours. Modification results in area reductions in all cases.

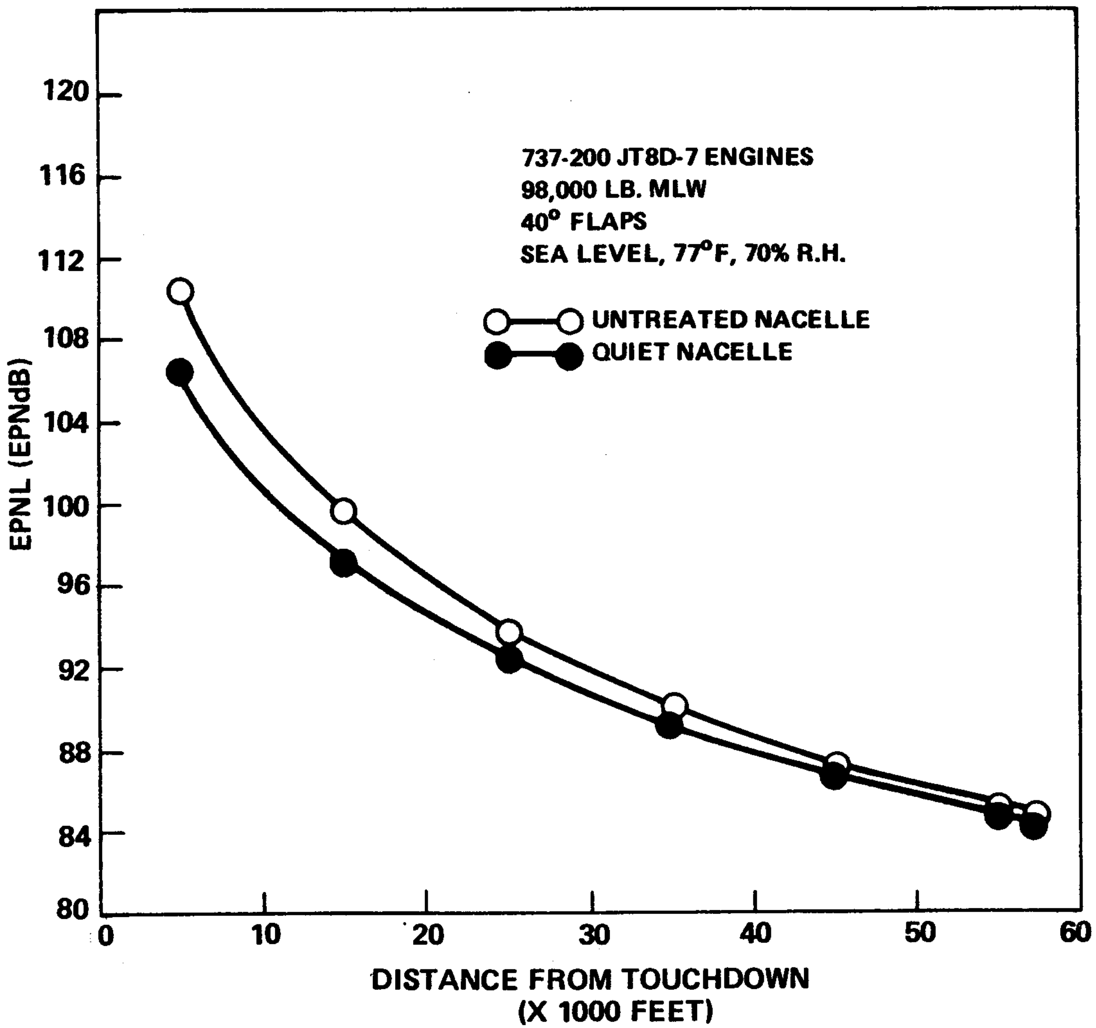
c. Contours of equal changes in exposure due to engine modification ("Delta dB Contours"). These curves show the locus of points of equal noise change as a result of modification from a baseline configuration. These contours outline the noise improved areas by shape and size.

REFERENCES FOR APPENDIX E

1. B.G. Williams and R. Yates, "Aircraft Noise Definition - Individual Aircraft Technical Data - Model 707/727/737/747," The Boeing Company, Federal Aviation Administration, Report FAA-EQ-7,, II/III/IV/V, December 1973.

2. J. S. Goodman, et.al., "Aircraft Noise Definition - Analysis of Existing Data for the DC-8, DC-9 and DC-10 Aircraft," Douglas Aircraft Company, Federal Aviation Administration, Report No. FAA-EQ-73-5, August 1973.

APPROACH 3° GLIDESLOPE



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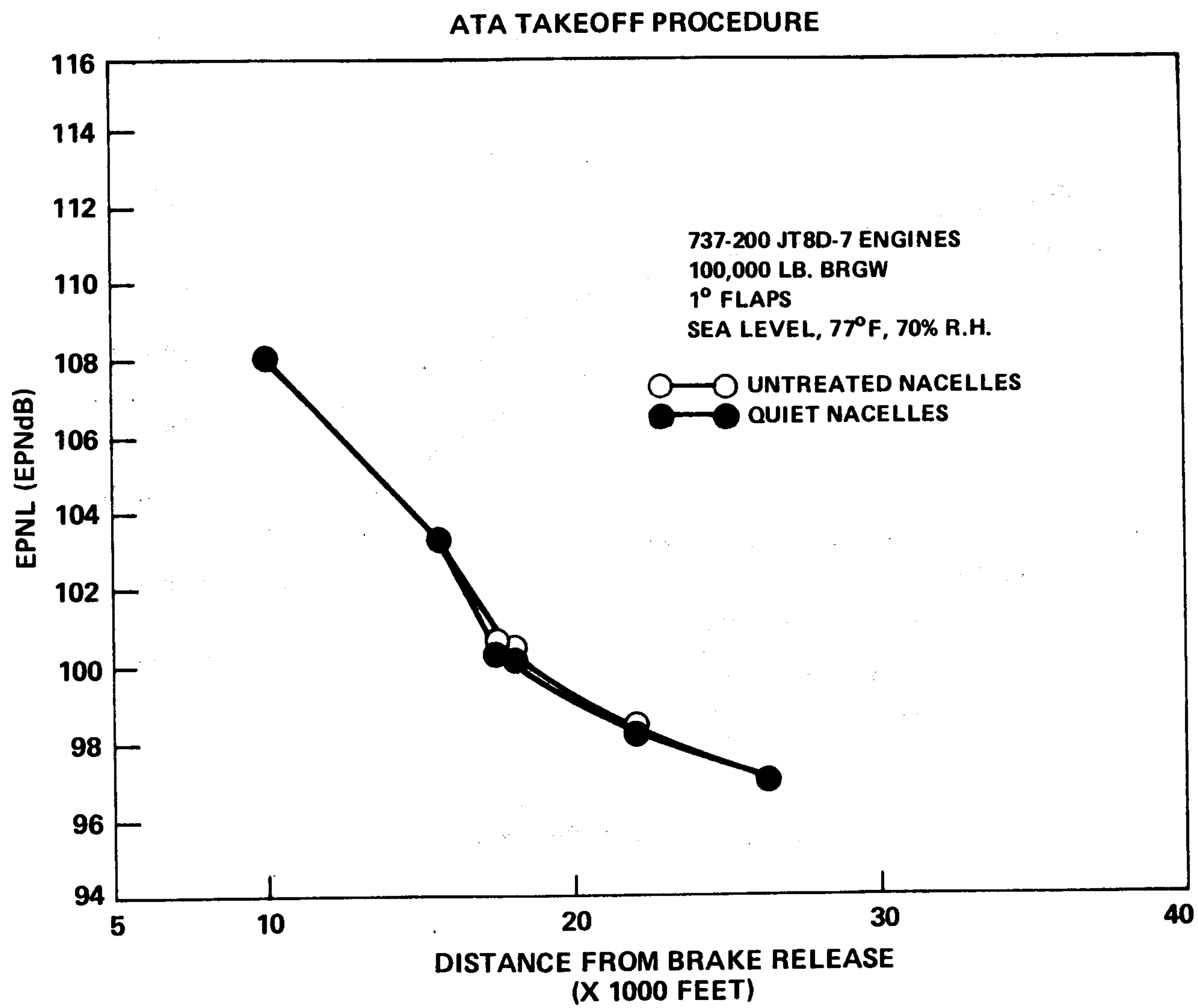
TC EQ-110



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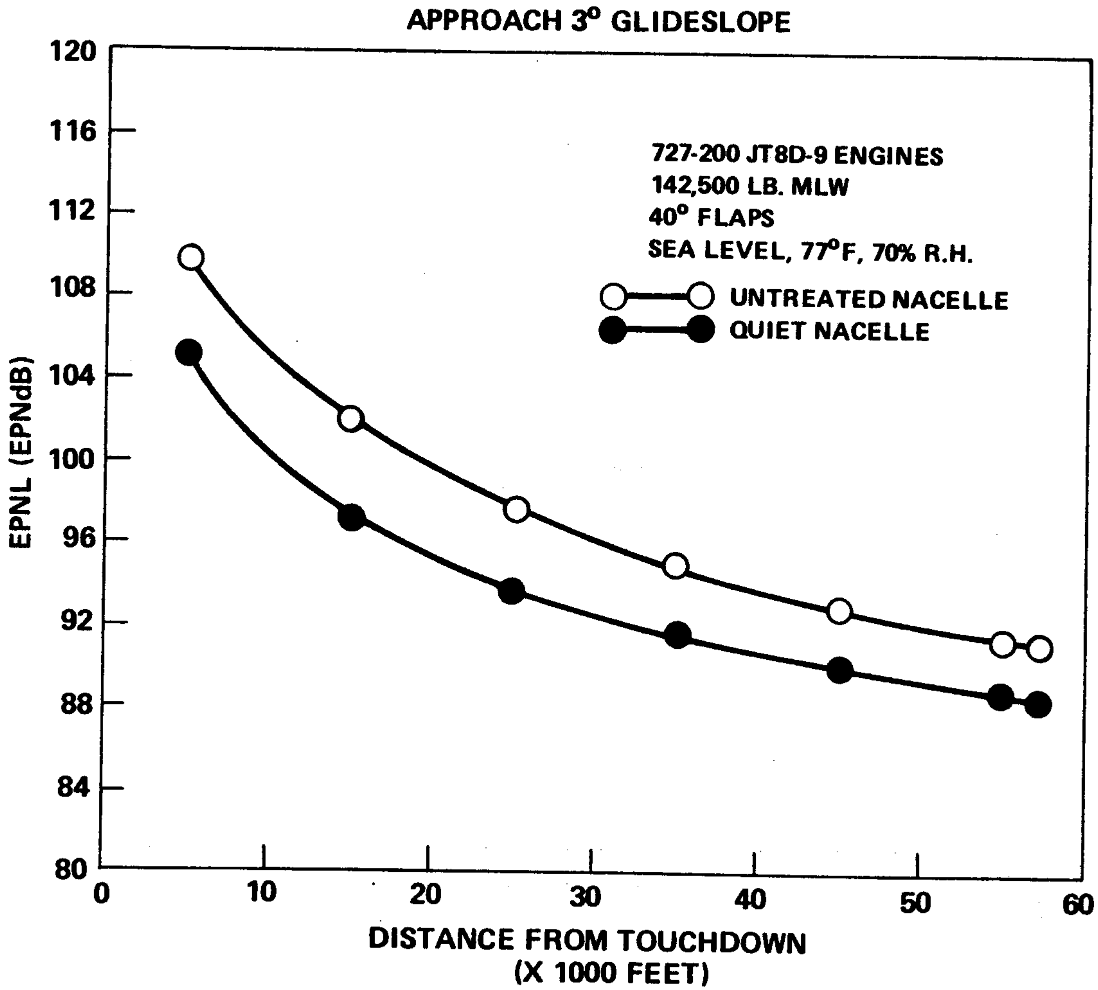

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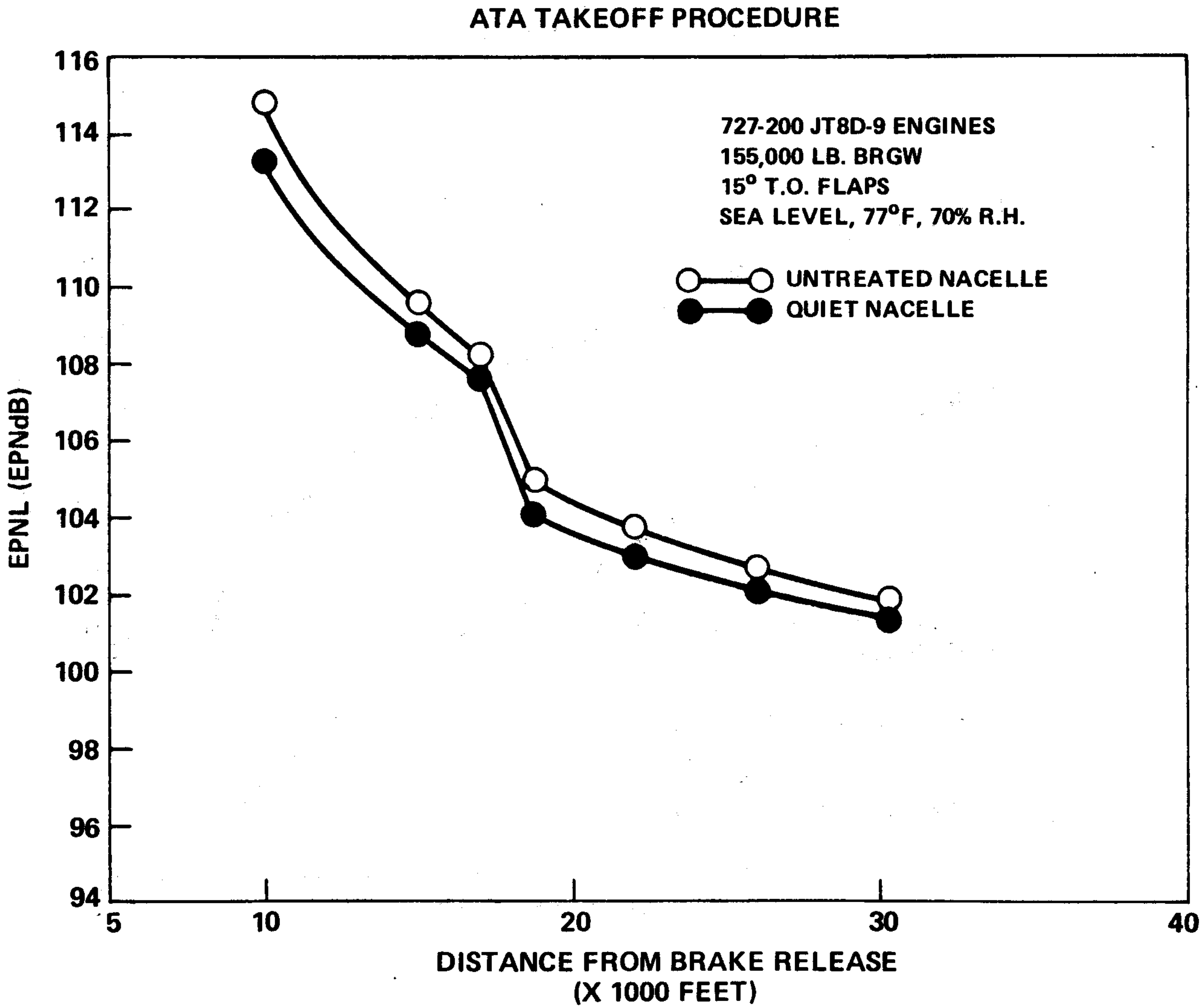

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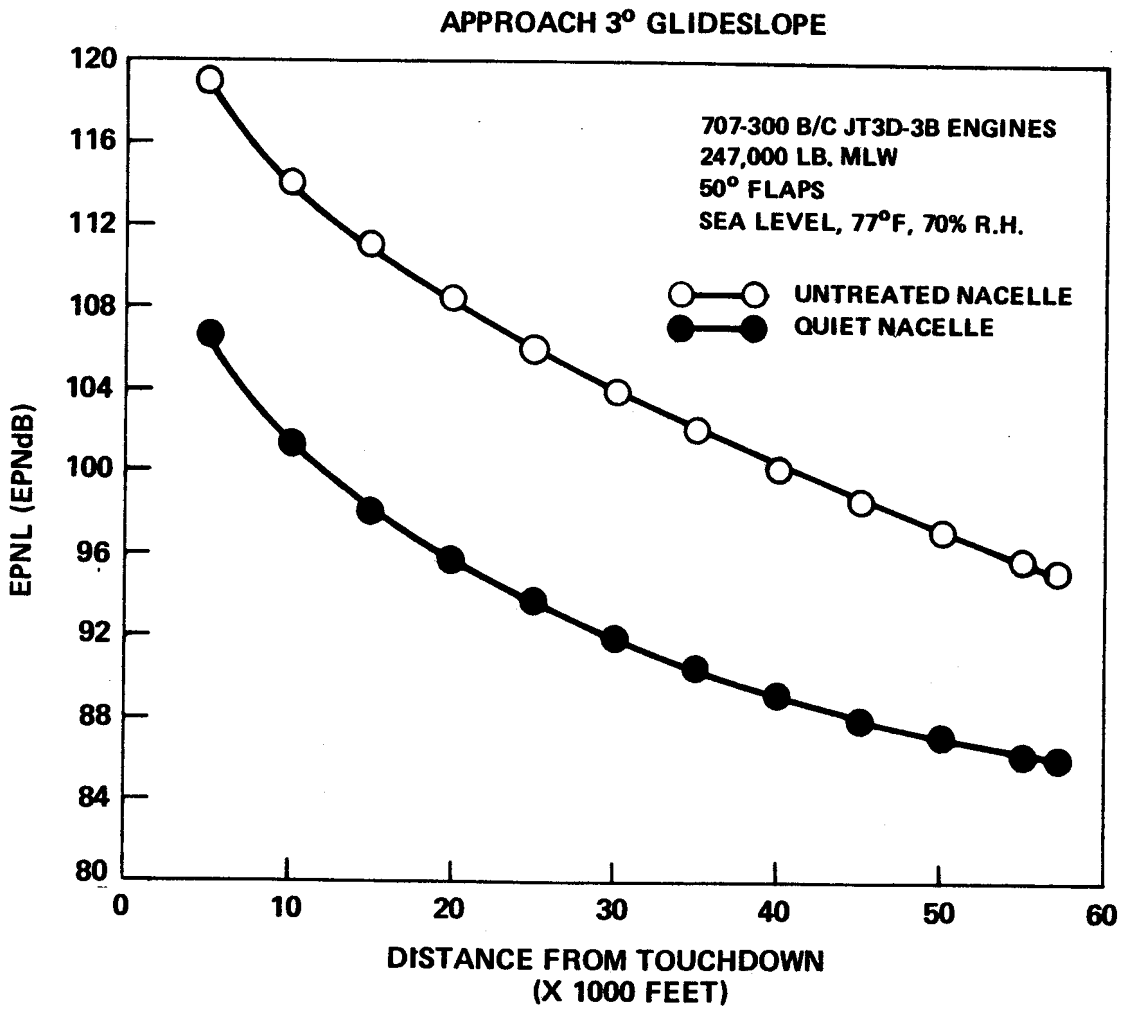

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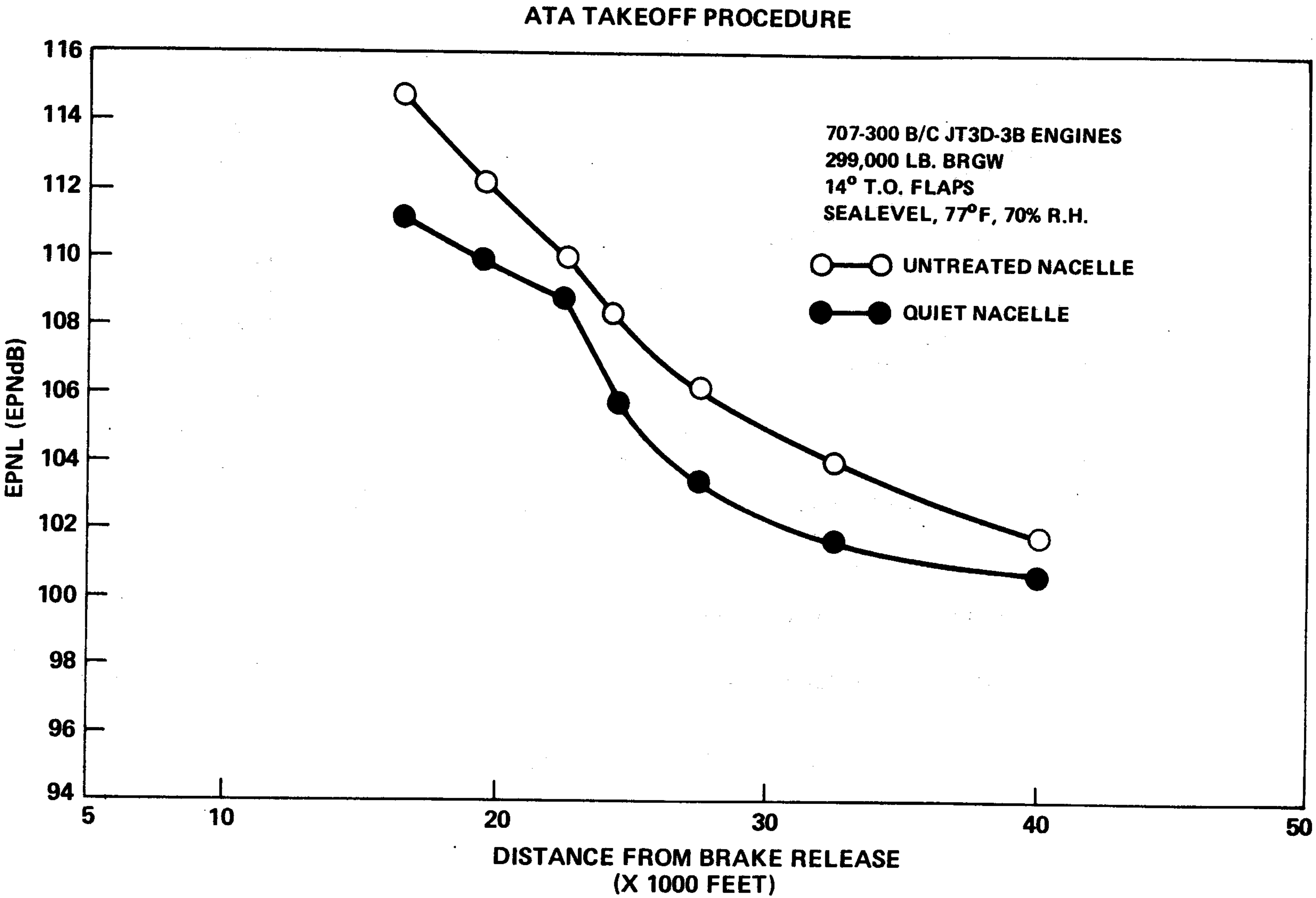

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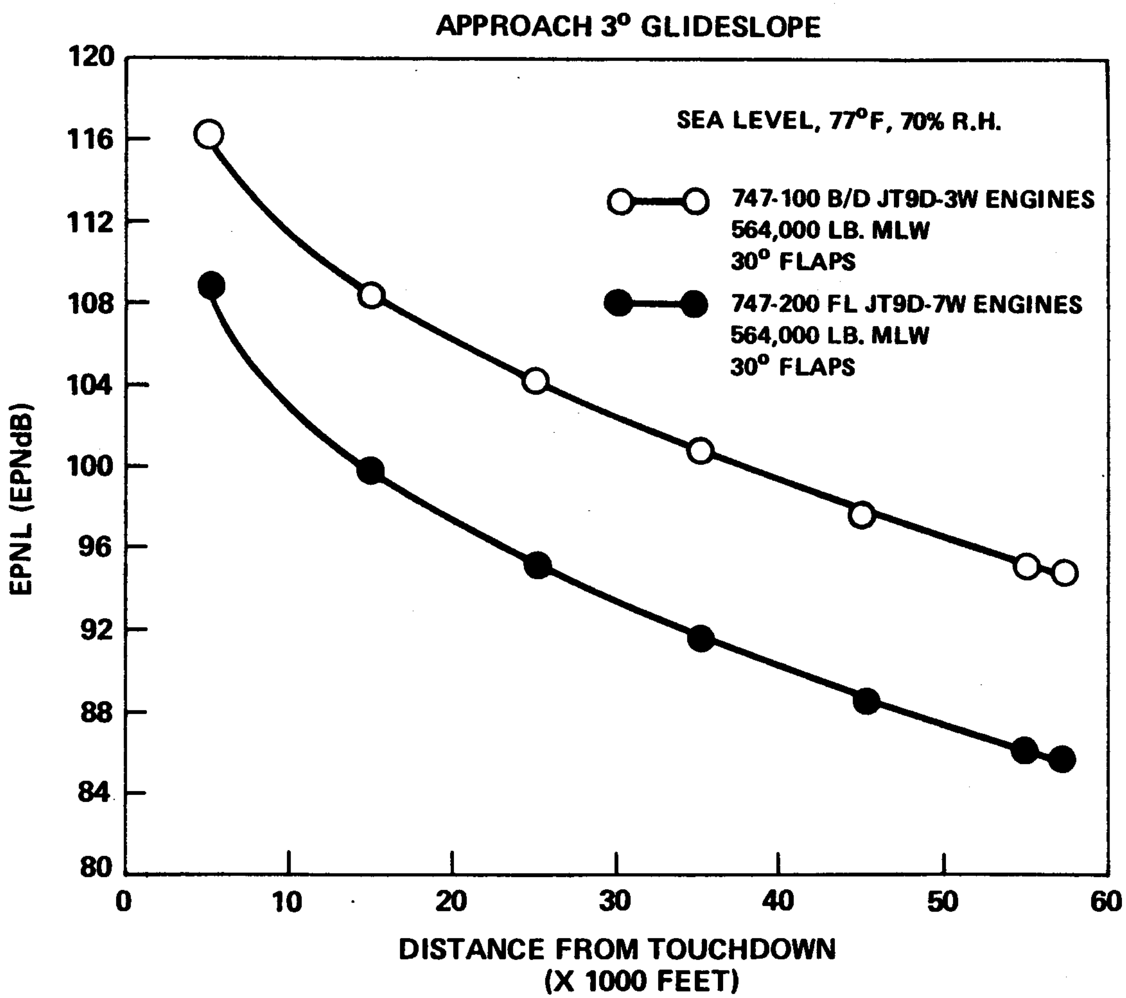

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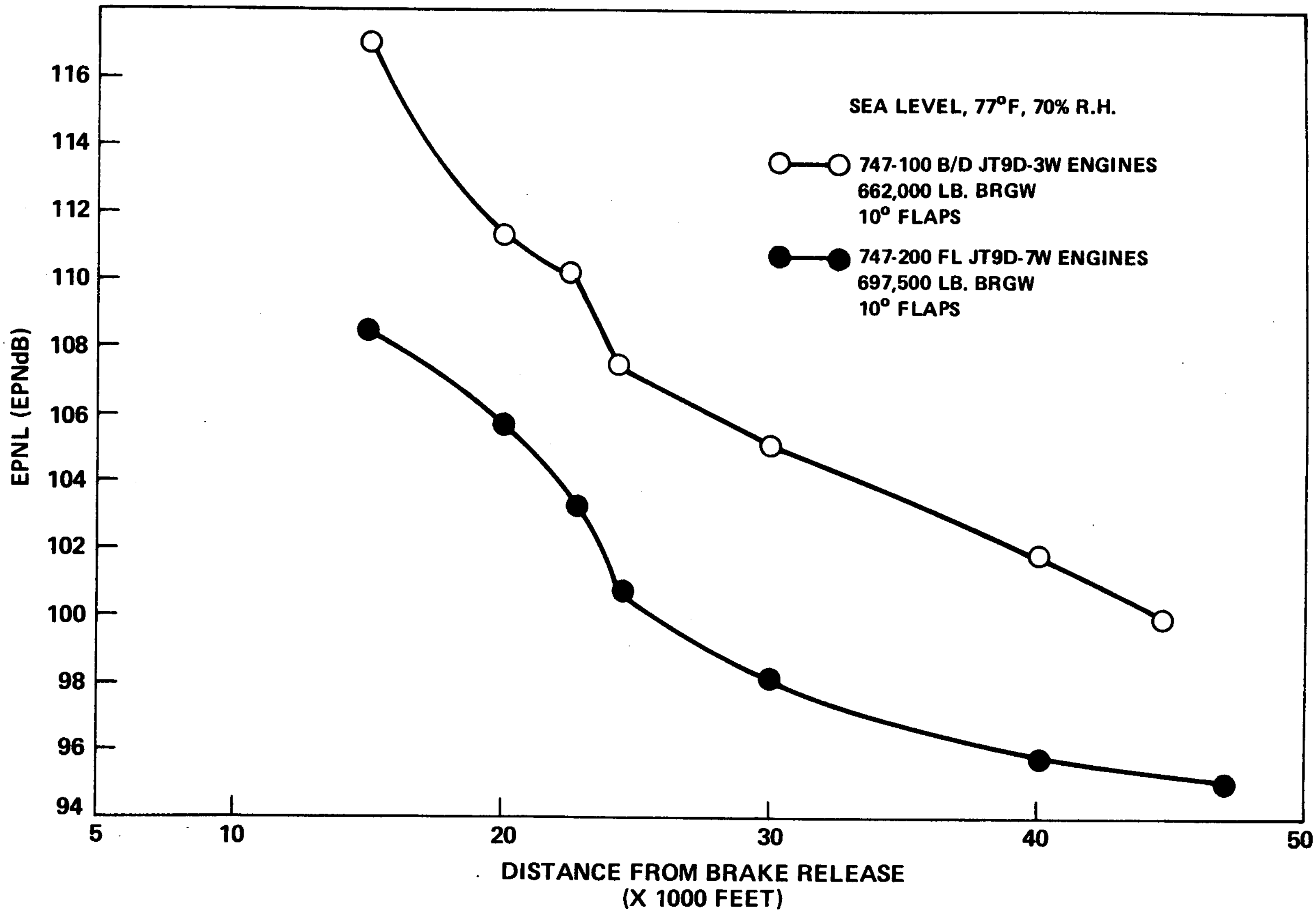
TC EQ-110

ATA TAKEOFF PROCEDURE



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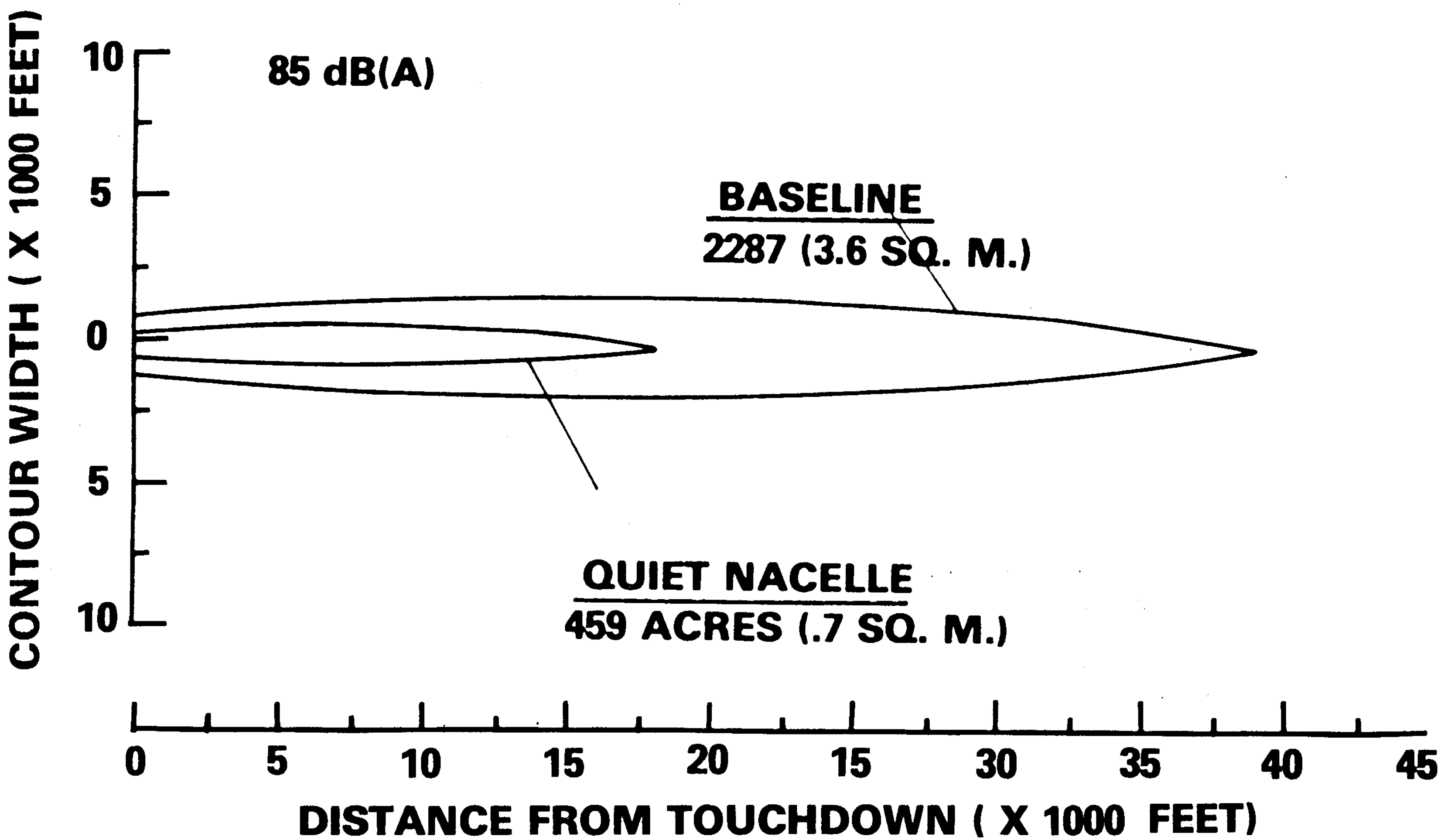
TC EQ-110

B707 - 300B — LANDING

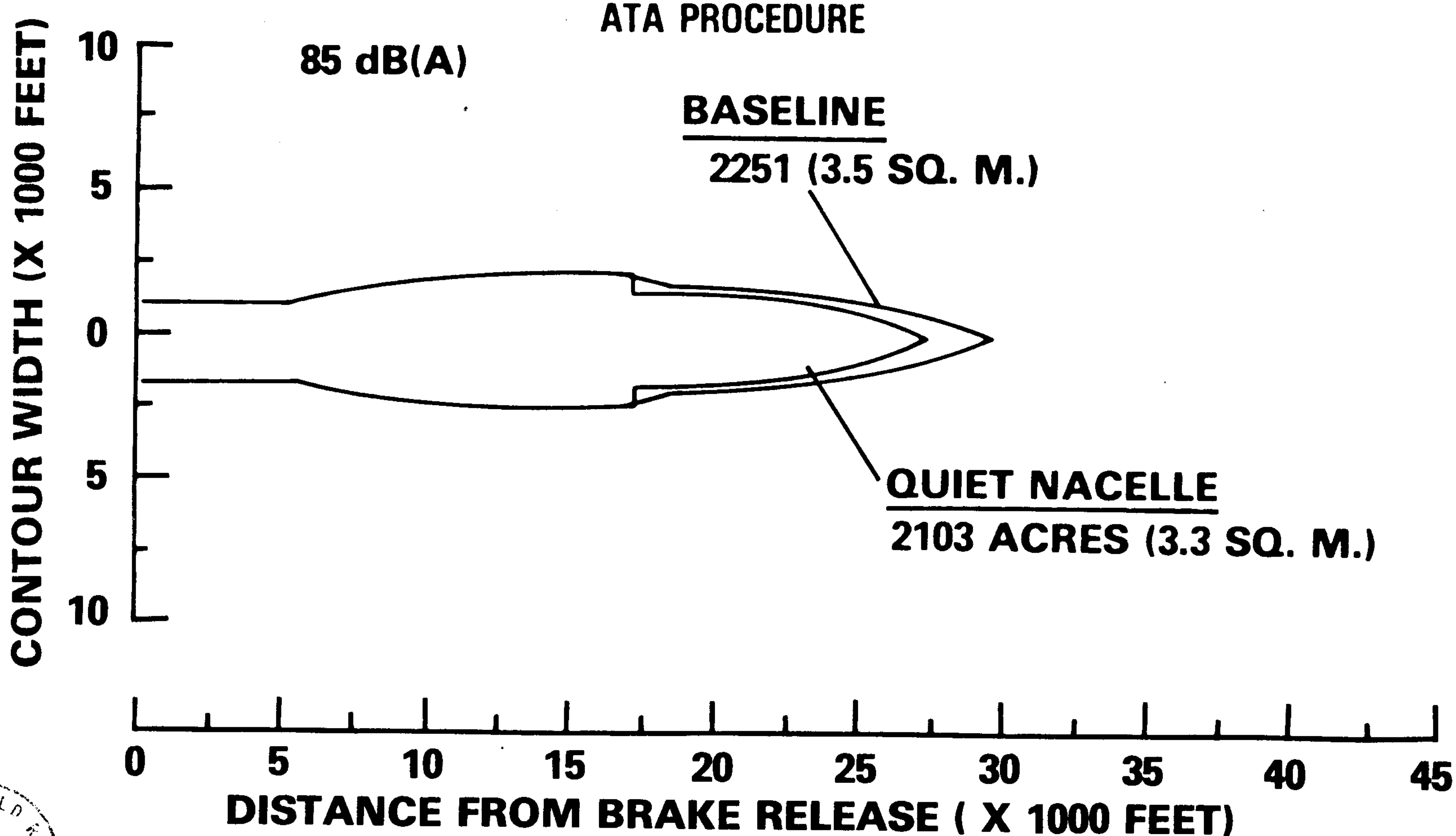
247,000 LBS. (MAXIMUM LANDING WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
3° GLIDESLOPE



TC/EQ-110 2/25/75

B707 - 300B — TAKEOFF

270,000 LBS. (80% MAXIMUM TAKEOFF WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
ATA PROCEDURE



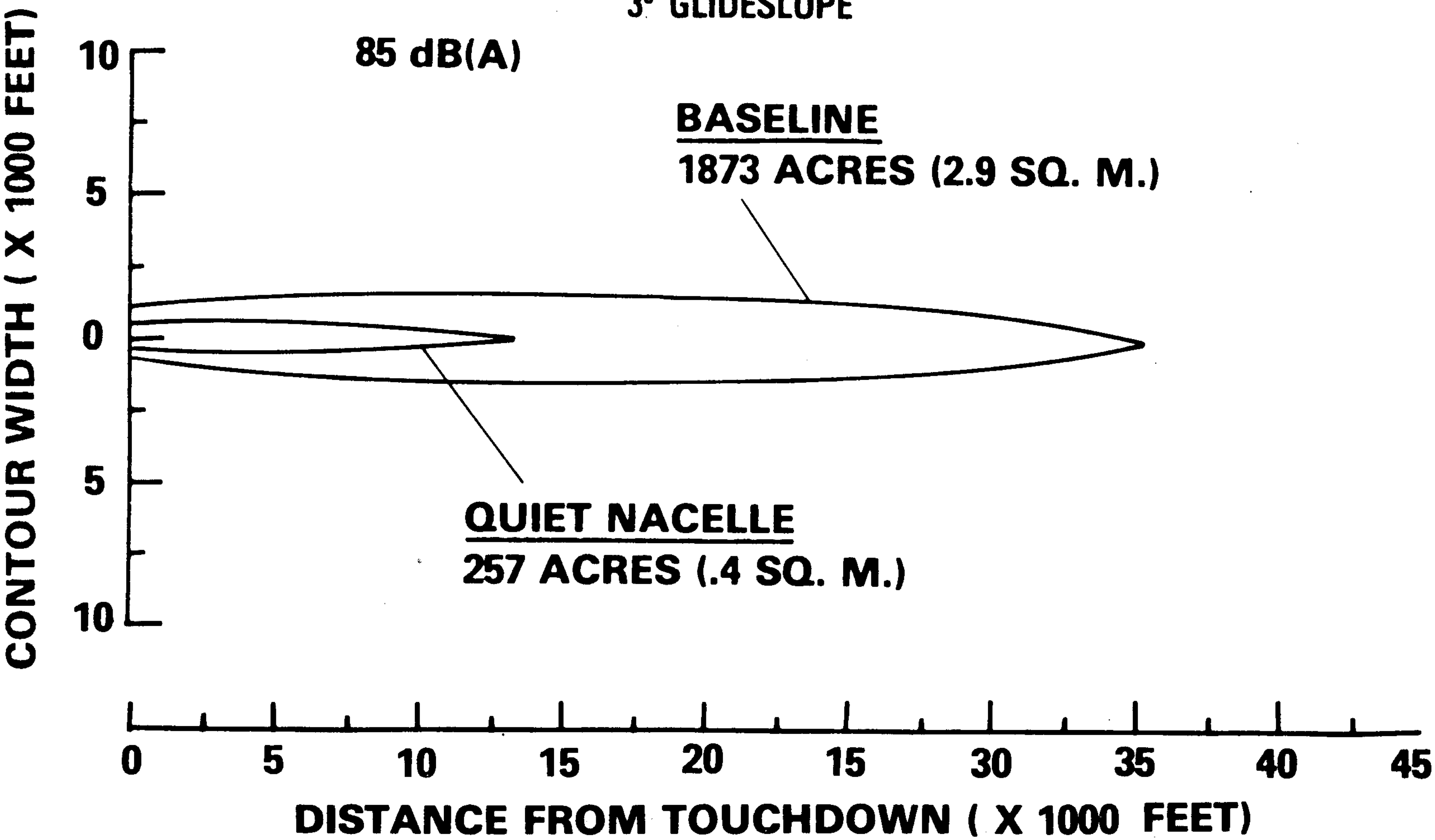
TC/EQ-110 2/25/75

B707 - 120B — LANDING

190,000 LBS. (MAXIMUM LANDING WEIGHT)

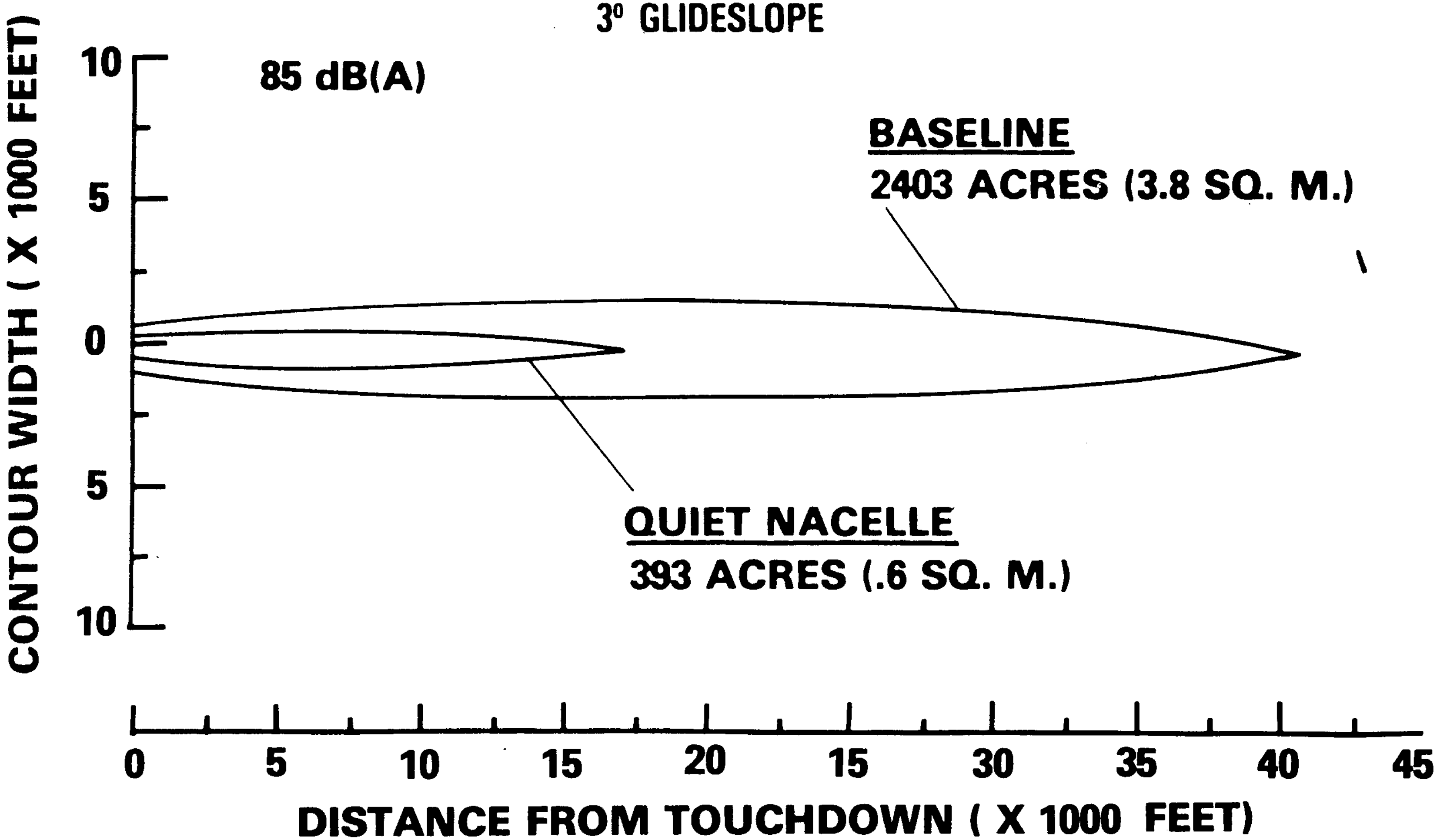
SEA LEVEL; 77° F, 70% R.H.

3° GLIDESLOPE



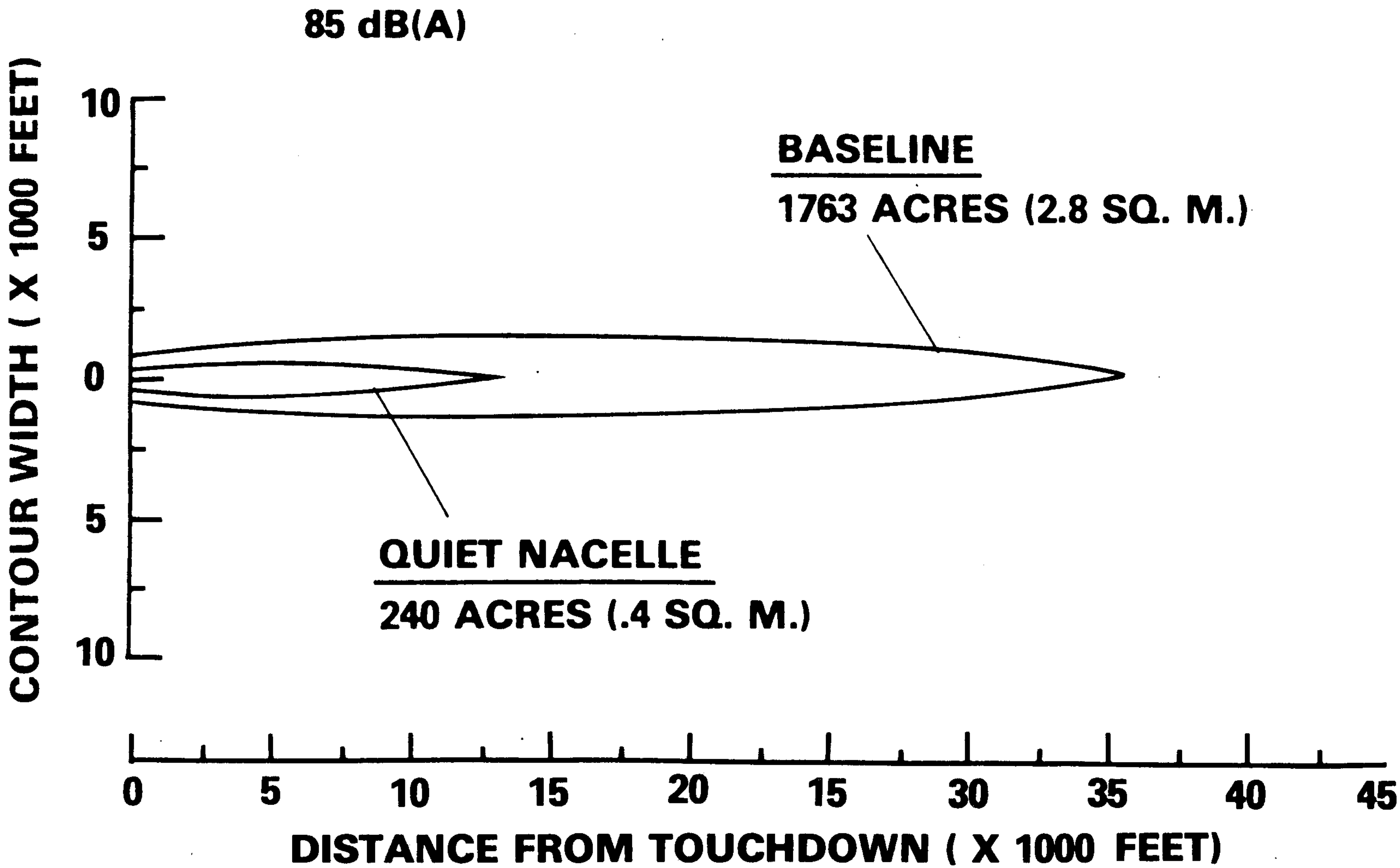
DC-8 -50/61 — LANDING

207,000 LBS. (MAXIMUM LANDING WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
3° GLIDESLOPE



DC-8-62/63 — LANDING

258,000 LBS. (MAXIMUM LANDING WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
3° GLIDESLOPE



TC/EQ-110 2/25/75

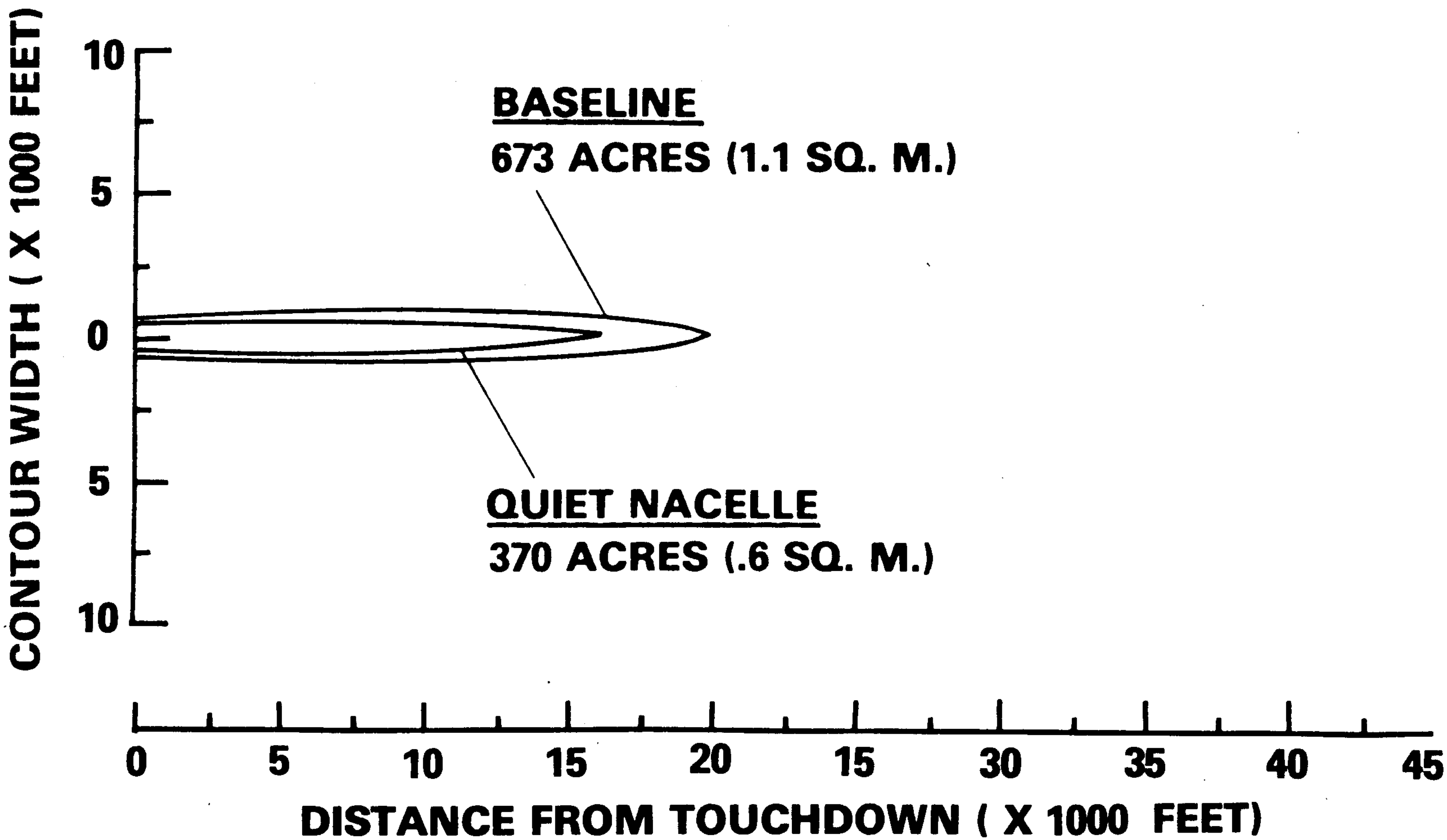
B727 - 100 JT8D-1/7 — LANDING

142,500 LBS. (MAXIMUM LANDING WEIGHT)

SEA LEVEL; 77° F, 70% R.H.

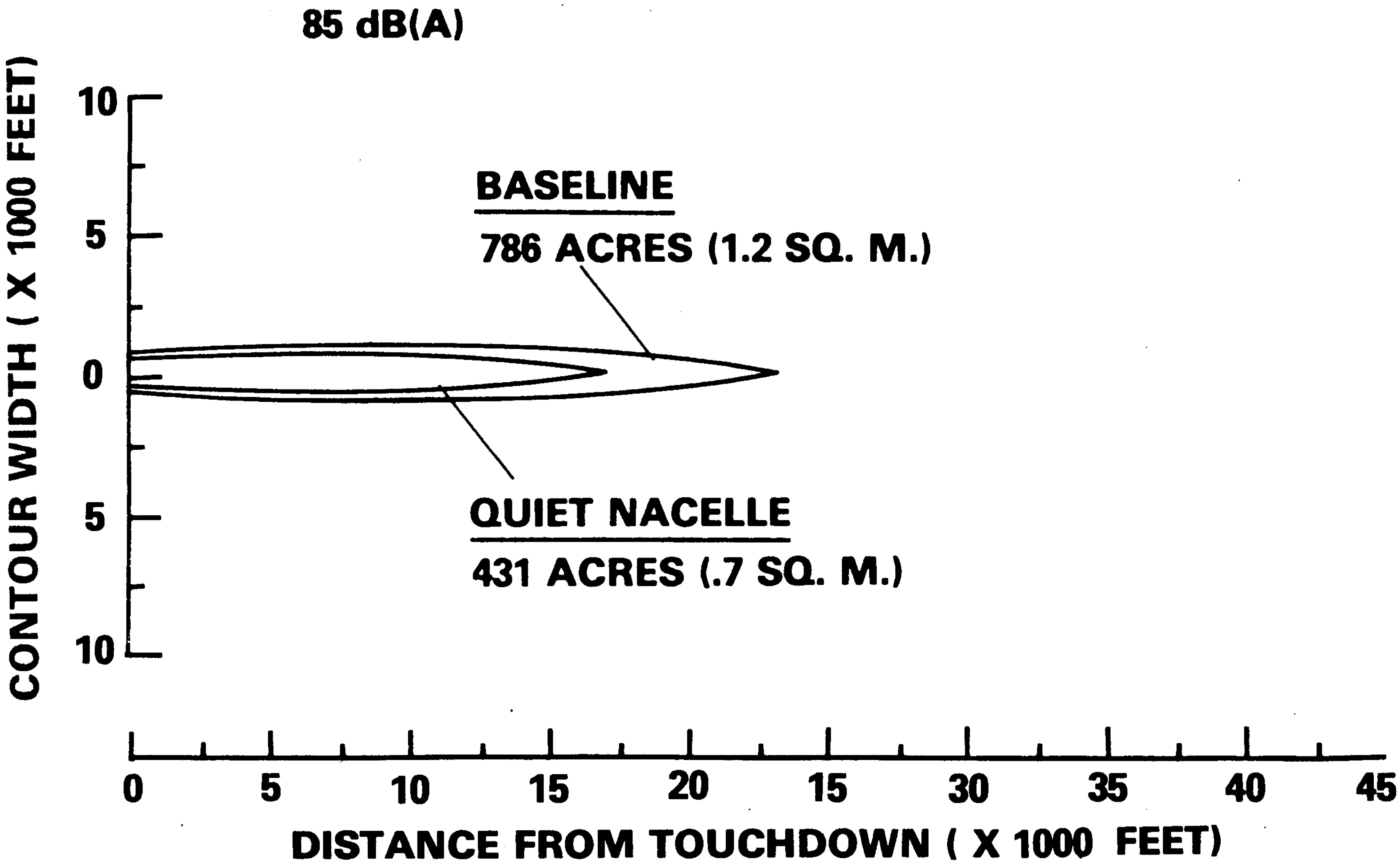
3° GLIDESLOPE

85 dB(A)



B727-200 JT8D-9 — LANDING

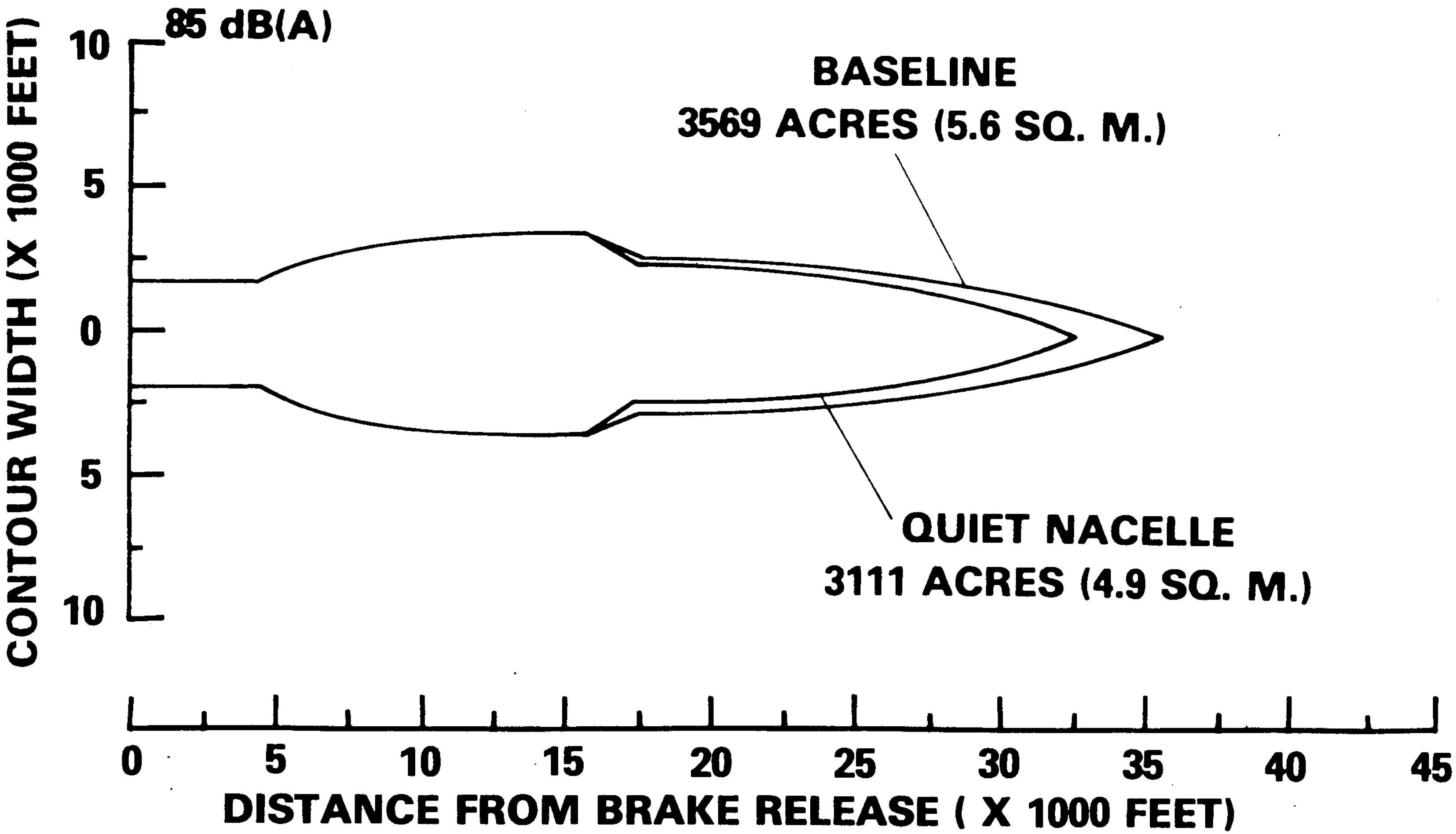
154,500 LBS. (MAXIMUM LANDING WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
3° GLIDESLOPE



TC/EQ-110 2/25/75

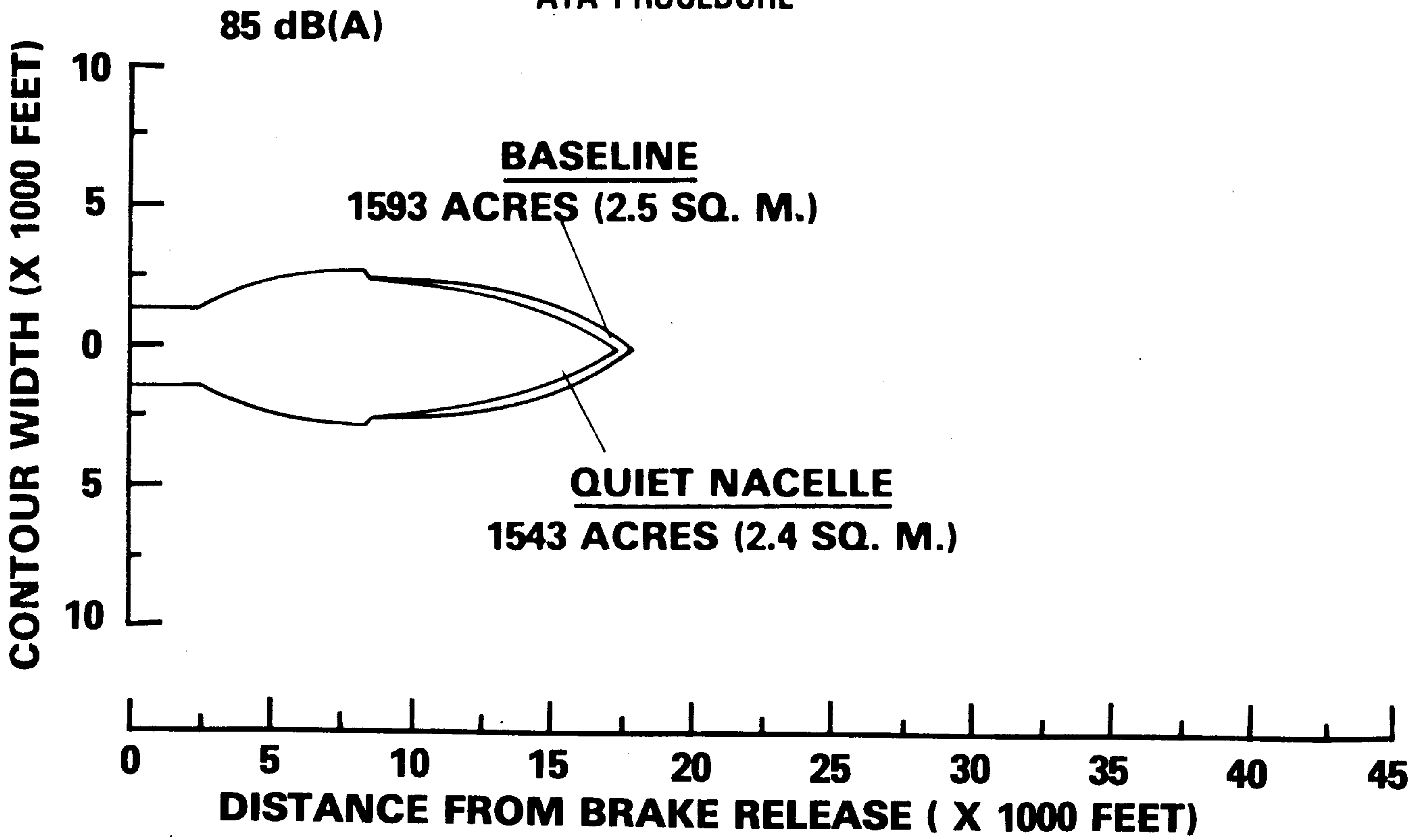
B727-200 JT8D-9 — TAKEOFF

150,000 LBS. (80% MAXIMUM TAKEOFF WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
ATA PROCEDURE



DC-9-10 — TAKEOFF

70,000 LBS. (80% MAXIMUM TAKEOFF WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
ATA PROCEDURE



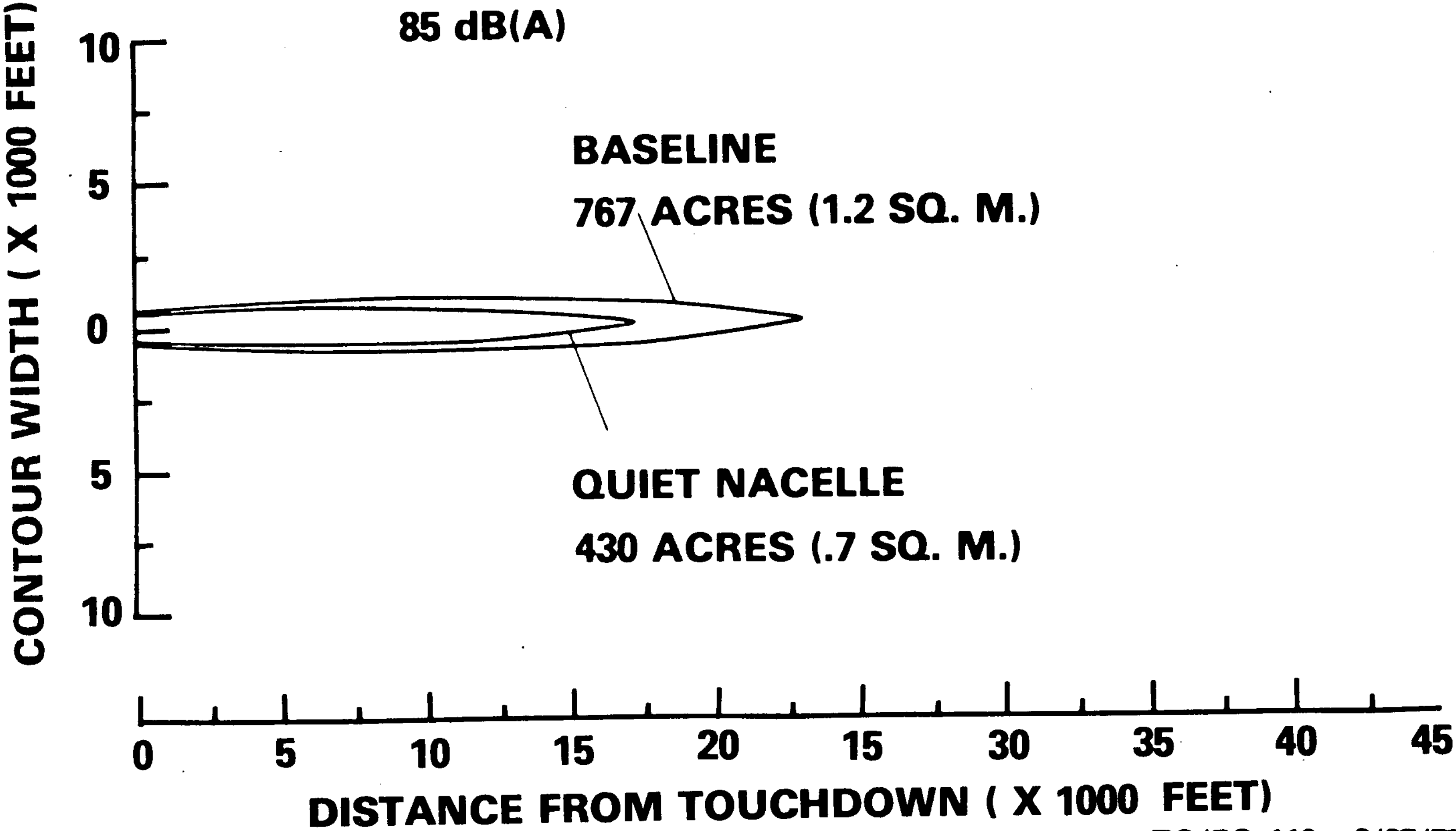
TC/EQ-110 2/27/75

DC-9 - 30 — LANDING

99,000 LBS. (MAXIMUM LANDING WEIGHT)

SEA LEVEL; 77° F, 70% R.H.

3° GLIDESLOPE



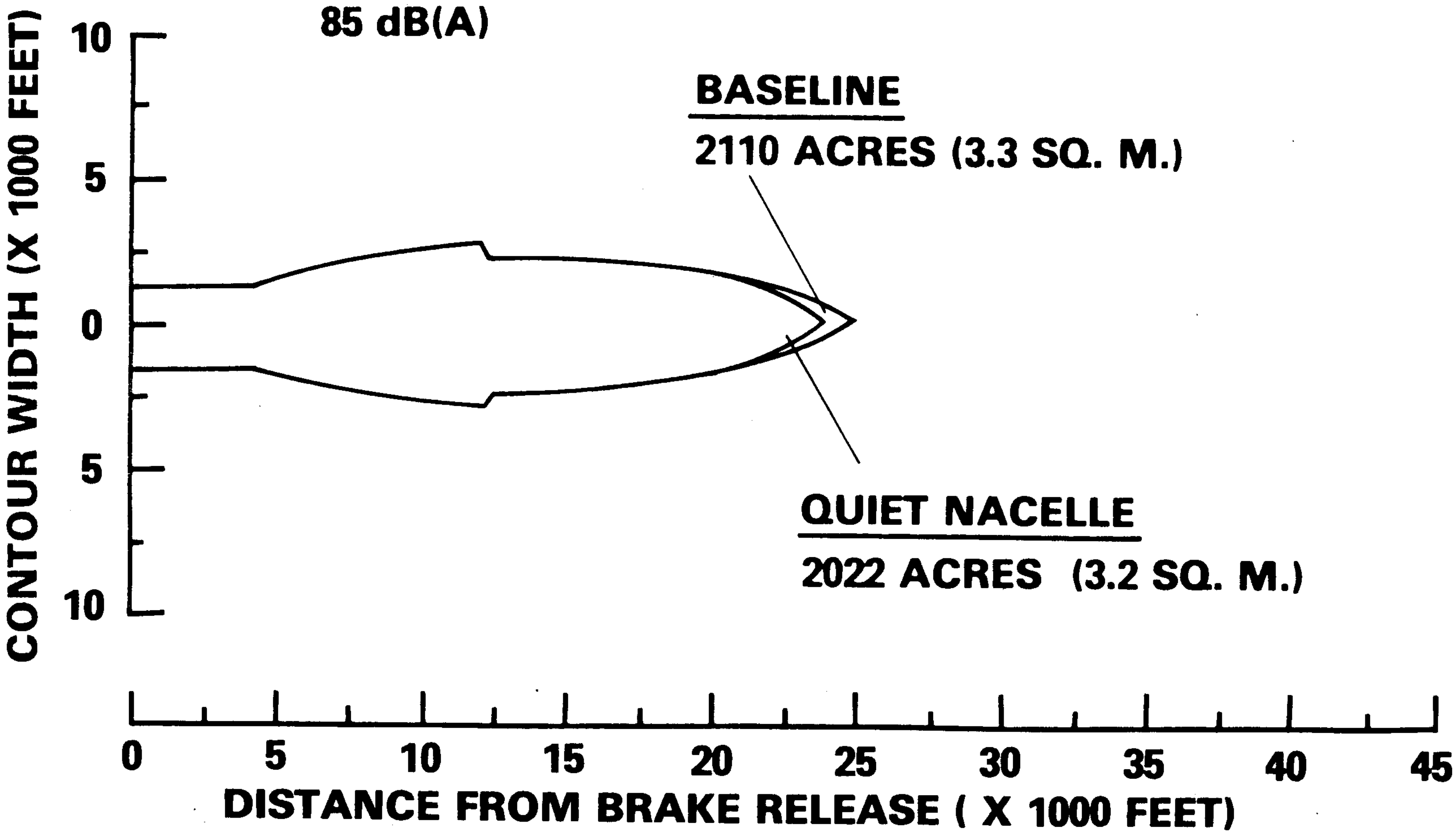
TC/EQ-110 2/27/75

DC-9-30 — TAKEOFF

90,000 LBS. (80% MAXIMUM TAKEOFF WEIGHT)

SEA LEVEL; 77° F, 70% R.H.

ATA PROCEDURE



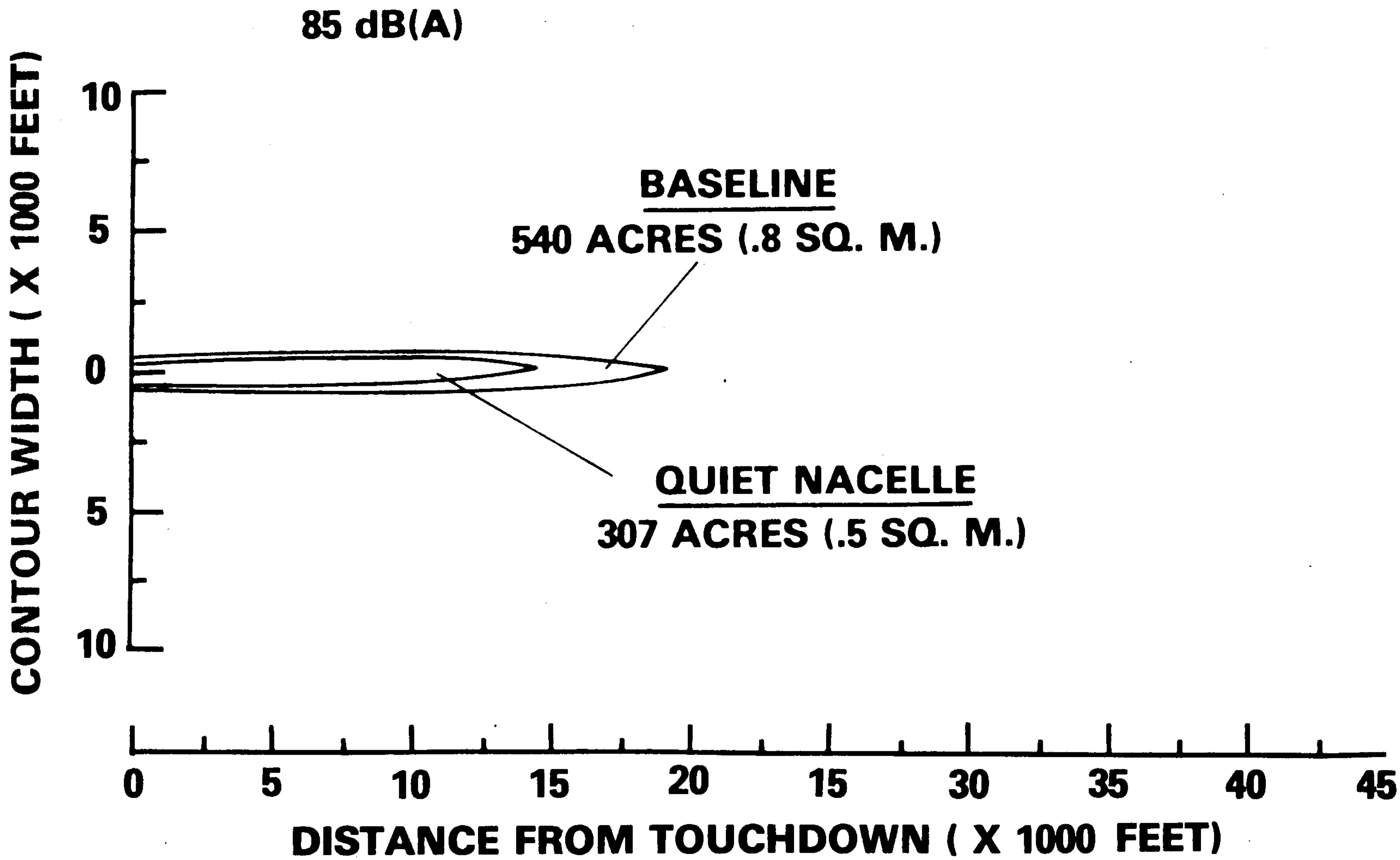
TC/EQ-110 2/27/75

B737-200 JT8D-1/7 LANDING

98,000 LBS. (MAXIMUM LANDING WEIGHT)

SEA LEVEL; 77° F, 70% R.H.

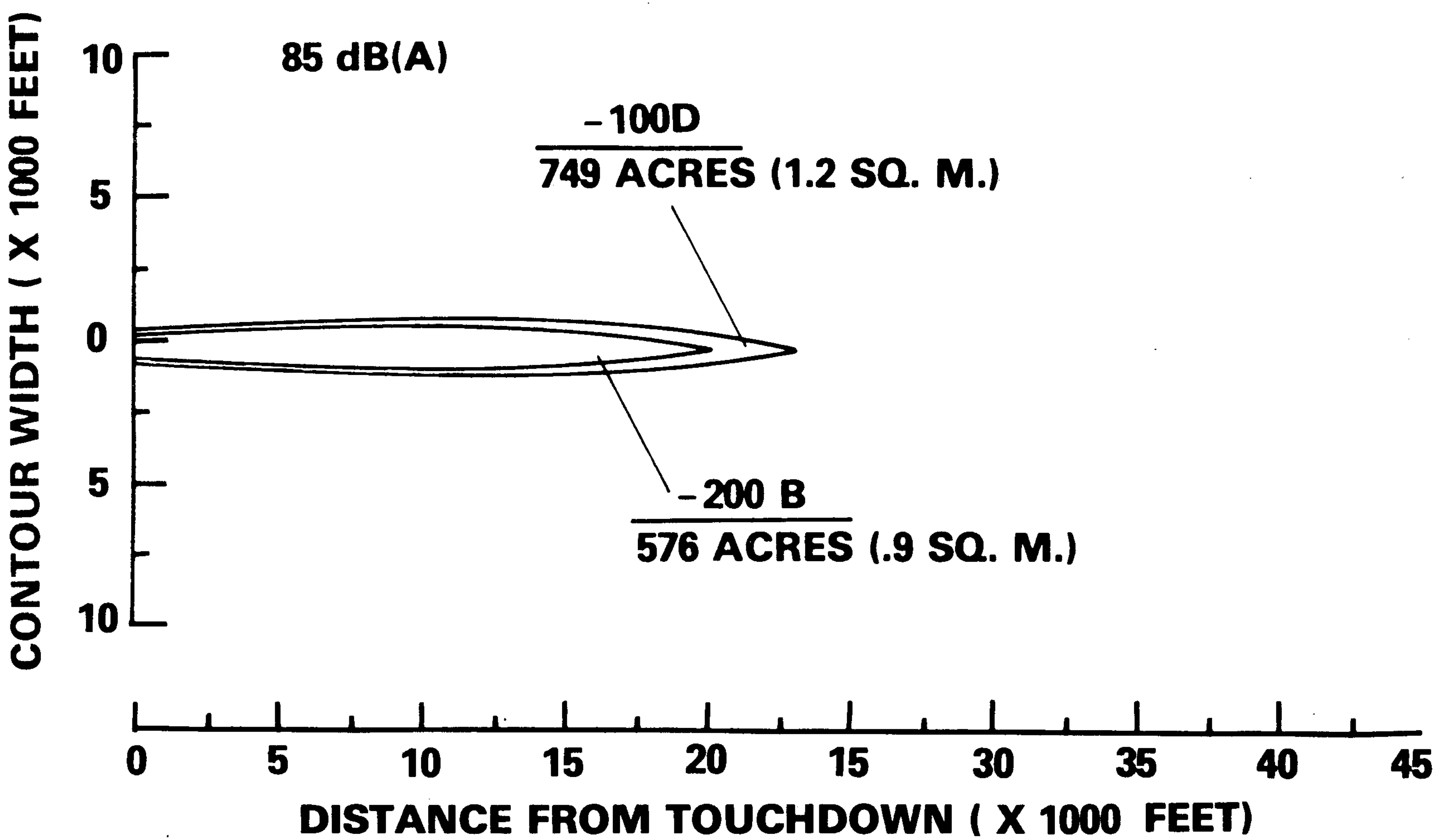
3° GLIDESLOPE



TC/EQ-110 2/27/75

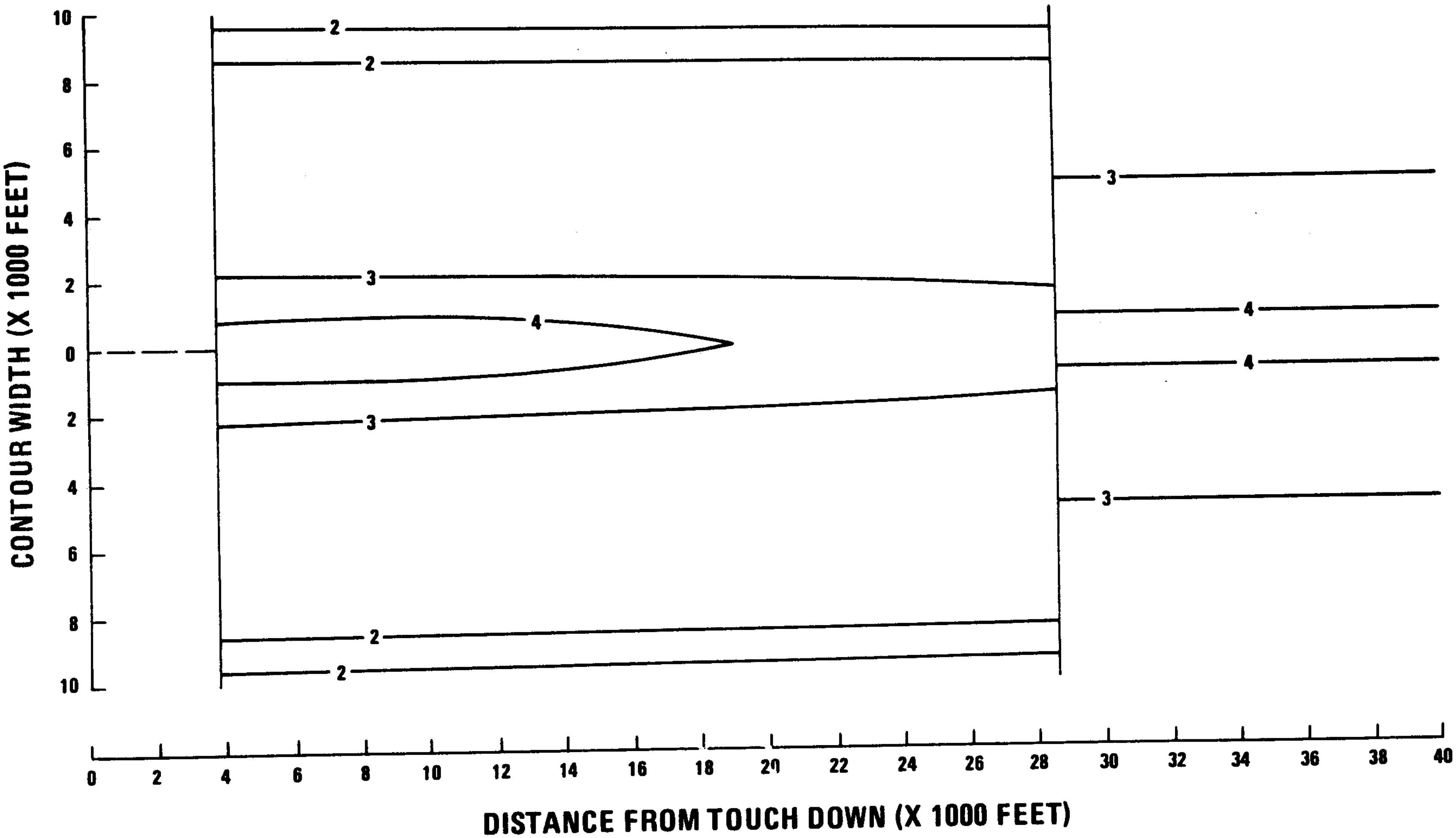
B747 JT9D-7W — LANDING

564,000 LBS. (MAXIMUM LANDING WEIGHT)
SEA LEVEL; 77° F, 70% R.H.
3° GLIDESLOPE

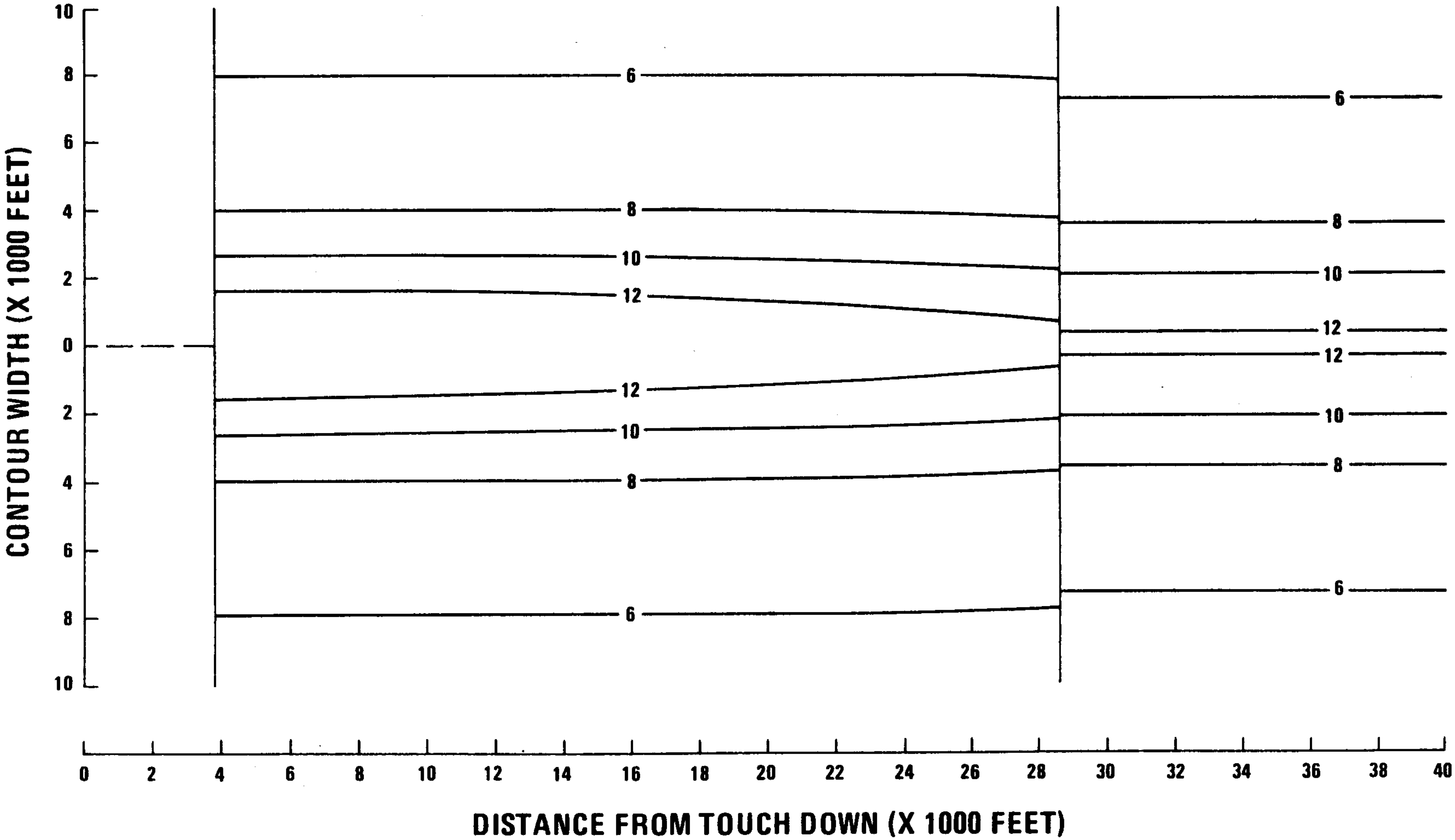


TC/EQ-110 2/26/75

DELTA DB CONTOURS (EPNdb)
BASELINE–QUIET NACELLE
3° APPROACH (1500′ INITIAL)
727–200 JT8D –9 40° FLAPS 154,500 LBS MLW
(15° FLAPS GEAR UP DURING LEVEL FLIGHT SEGMENT)



DELTA DB CONTOURS (EPNdB)
BASELINE–QUIET NACELLE
3° APPROACH (1500′ INITIAL)
707–300 JT3D–3B 50° FLAPS 247,000 LBS. MLW
(25° FLAPS GEAR UP DURING LEVEL FLIGHT SEGMENT)



APPENDIX F: IMPACT OF NOISE ON PEOPLE

APPENDIX F

IMPACT OF NOISE ON PEOPLE

How people perceive loudness or noisiness of any given sound depends on several measurable physical characteristics of the sound. These factors are:

a. Intensity - a ten decibel increase in intensity is considered a doubling of the perceived loudness or noisiness of a sound;

b. Frequency content - sounds with concentration of energy between 2,000 Hertz and 8,000 Hertz are perceived to be more noisy than sounds of equal sound pressure level outside this range;

c. Duration - the perceived loudness of a sound will increase with its duration. An increase in duration by a factor of 10 results in a change that is roughly equivalent to 10 decibels or an increase in noisiness by a factor of two;

d. Changes in sound pressure level - sounds that are increasing in level are judged to be somewhat louder than those decreasing in level;

e. Rate of increase of sound pressure level - impulsive sounds, ones reaching a high peak very abruptly, are usually perceived to be very noisy.

The task of quantifying the environmental impact of noise associated with any noise source requires the application of statistics and averages. This approach is necessary because individual human response to noise is subject to considerable natural variance. Over the past 25 years researchers have identified many of the factors which contribute to the variation in individual human reaction to noise.

Knowledge of the existence of these individual variables helps to understand why it is not possible to state simply that a given noise level from a given noise source will elicit a particular community reaction or have a particular environmental impact. Research in psychoacoustics has revealed than an individual's attitudes, beliefs and values may greatly influence the degree to which a person considers a given sound annoying. The aggregate emotional response of an individual has been found to depend on:

a. Feelings about the necessity or preventability of the noise. If people feel that their needs and concerns are being ignored, they are more likely to feel hostility towards the noise. This feeling of being alienated or of being ignored and abused is the root of many human annoyance reactions. If people feel that those creating the noise care about their welfare and are doing what they can to mitigate the noise, they are usually more tolerant of the noise and are willing and able to accommodate higher noise levels.

b. Judgment of the importance and of the value of the primary function of the activity which is producing the noise.

c. Activity at the time an individual hears a noise and the disturbance experienced as a result of the noise intrusion. An individual's sleep, rest and relaxation have been found to be more easily disrupted by noise than his communication and entertainment activities.

d. Attitudes about environment. The existence of undesirable features in a person's residential environment will influence the way in which he reacts to a particular intrusion.

e. Belief concerning the effect of noise on health.

f. General sensitivity to noise. People vary in their ability to hear sound, their physiological predisposition to noise and their emotional experience of annoyance to a given noise.

g. Feeling of fear associated with the noise. For instance, the extent to which an individual fears physical harm from the source of the noise will affect his attitude toward the noise.

A number of physical factors have also been identified by researchers as influencing the way in which an individual may react to a noise. These other factors include:

a. Type of neighborhood - instances of annoyance, disturbances and complaint associated with a particular noise exposure will be greatest in rural areas, followed by suburban and urban residential areas, and then commercial and industrial areas in decreasing order.

b. Time of day - a number of studies have indicated that noise intrusions are considered more annoying at night than during the day.

c. Season - noise is considered more disturbing in the summer than in the winter. This is understandable since windows are likely to be open in the summer and recreational activities take place out of doors.

d. Predictability of the noise - research has revealed that individuals exposed to unpredictable noise have a lower noise tolerance than those exposed to predictable noise.

e. Control over the noise source - a person who has no control over the noise source will be more annoyed than one who is able to exercise some control.

f. Length of time an individual is exposed to a noise - there is little evidence supporting the argument that annoyance resulting from noise will decrease with continued exposure, rather, under some circumstances, annoyance may increase the longer one is exposed.

Aircraft Noise Indices

There are two basic schemes for quantifying the noise associated with aircraft operations. One method considers the noise generated by all aircraft over a cumulative twenty-four hour period, while the other quantifies the sound levels of a single aircraft measured at various points on the ground during the takeoff and landing. Both methods involve acoustical frequency and time dependent weightings of the basic sound pressure level data.

A number of cumulative noise exposure techniques have been developed in the United States, including a Noise Exposure Forecast (NEF), Composite Noise Rating (CNR), Day/Night Sound Level (Ldn), and Aircraft Sound Description System (ASDS).*

The primary noise metric used in the EIS is NEF, based on the Effective Perceived Noise Levels in units of EPNdB. The NEF analysis involves construction of contours which link together points of equal cumulative noise exposure. The contours are generated by a computer technique based on the following input data: airport flight patterns, number of daily aircraft operations by type of aircraft and weight and time of day,

*There are equivalencies among the various cumulative noise indices. Any given NEF is equivalent to LDn minus 35, plus or minus 3. For example, NEF 30 is approximately equal to Ldn 65. Between NEF and CNR there is a non-linear relationship. The general equivalencies are shown below (Ref. 1).

NEF 20	= CNR 85	= NNI 22	= Ldn 55
NEF 30	= CNR 100	= NNI 38	= Ldn 65
NEF 40	= CNR 115	= NNI 56	= Ldn 75

noise characteristics of each aircraft in terms of EPNL during takeoff and landing and typical runway utilization patterns in terms of percentage of use.

It is important to keep in mind the assumptions and limitations when comparing sound levels of different aircraft at any given point. The difference in sound levels between two aircraft under comparison will not usually be the same at different locations on the ground. This reflects the differences in their rates of climb, climb gradients, flight paths, thrust settings, and acoustical spectra.

In order to convey the intensity and relative impact of single event noise in A-weighted levels, Table I describes typical dBA values of noise commonly experienced by people.

Quantifying Human Response to Noise

The inherent variability in the way individuals react to noise makes it impossible to predict accurately how any one individual will respond to a given noise. However, considering the community as a whole, trends emerge which relate noise to annoyance. In this way it is possible to correlate a noise index (cumulative or single event) with community annoyance. This index will represent the average annoyance response for the community.

TABLE I

Comparative Noise Levels

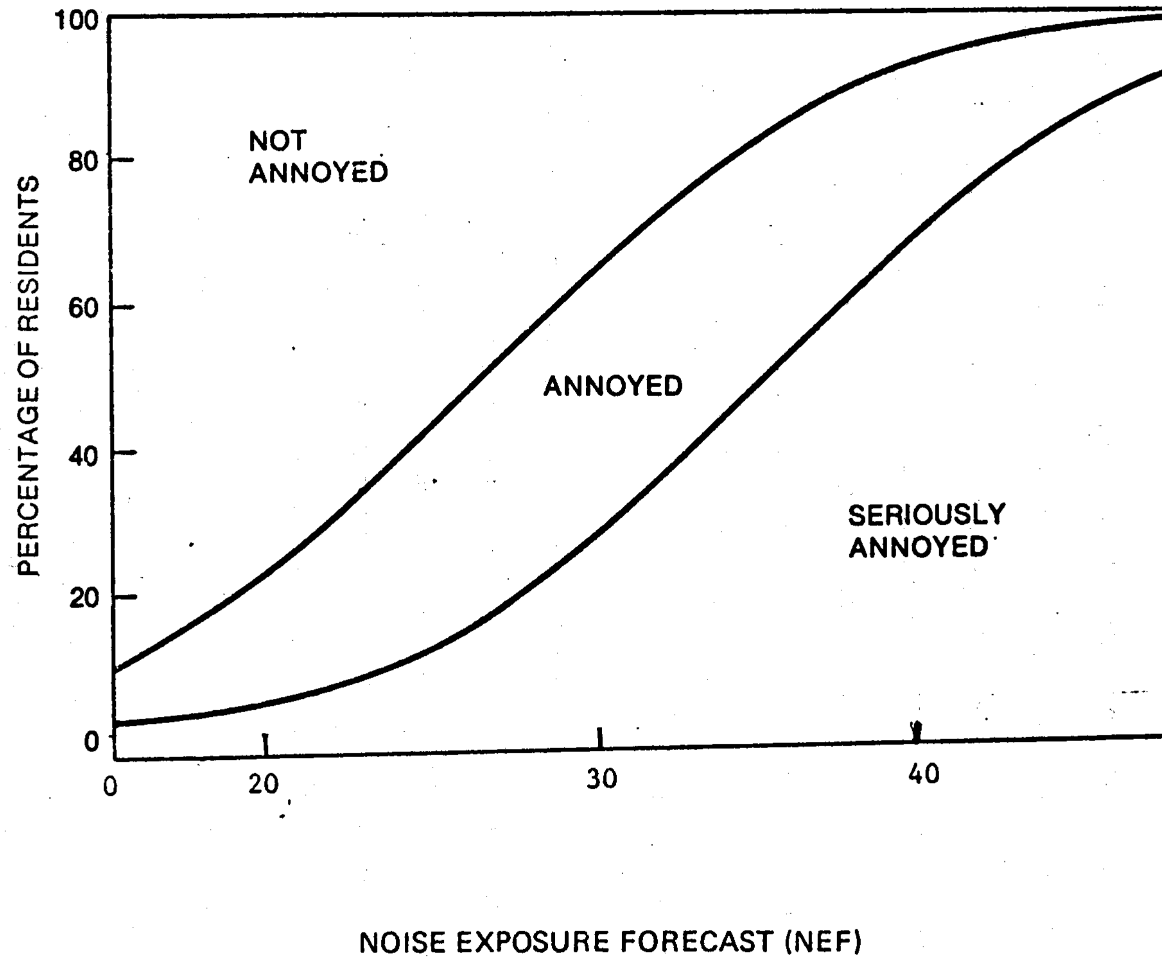
Typical decibel (dBA) values encountered in daily life and industry

	dBA
Rustling leaves	20
Room in a quiet dwelling at midnight	32
Soft whispers at 5 feet	34
Men's clothing department of large store	53
Window air conditioner	55
Conversational speech	60
Household department of large store	62
Busy restaurant	65
Typing pool (9 typewriters in use)	65
Vacuum cleaner in private residence (at 10 feet)	69
Ringing alarm clock (at 2 feet)	80
Loudly reproduced orchestral music in large room	82
Over 85 dBA, beginning of hearing damage if prolonged	
Printing press plant (medium size automatic)	86
Heavy city traffic	92
Heavy diesel-propelled vehicle (about 25 feet away)	92
Air grinder	95
Cut-off saw	97
Home lawn mover	98
Turbine condenser	98
150 cubic foot air compressor	100
Banging of steel plate	104
Air hammer	107
Jet airliner (500 feet overhead)	115

In utilizing data relating any given measure of noise level or exposure to average community annoyance it is important to note that there will exist a given percentage of the population highly annoyed, a given percentage mildly annoyed and others who will not be annoyed at all. The changing percentage of population within a given response category is the best indicator of noise annoyance impact. The population tables contained in the text show the number of people exposed to various levels of cumulative noise exposure. These levels are in turn related to percent of population falling within various response categories.

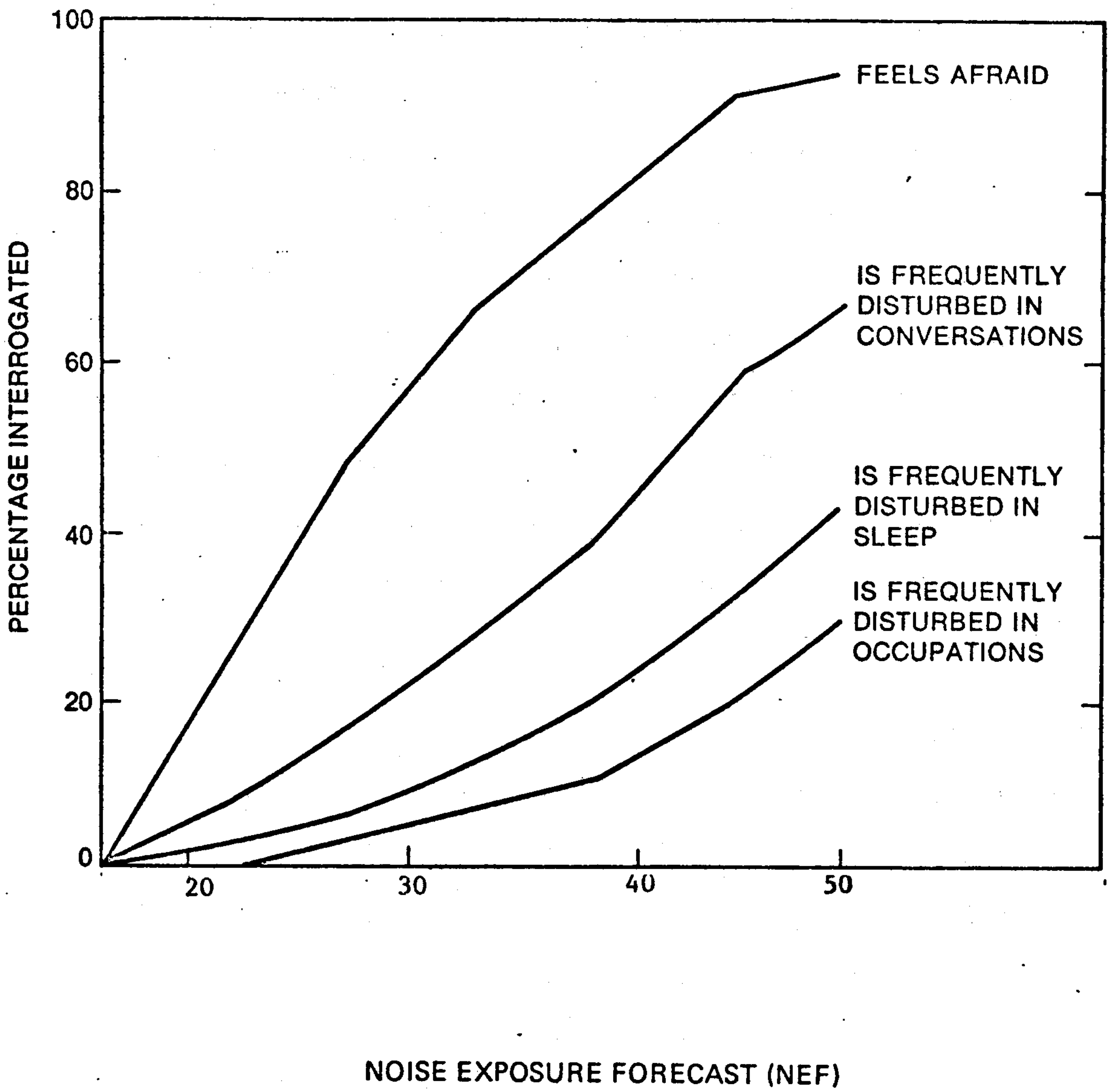
The ensuing discussion focuses on the results of representative research concerned with the relationship between annoyance and noise exposure. A brief examination of these results follows along with a table summarizing the findings. The references cited are at the end of this appendix.

Ollerhead (Ref. 1) in analyzing the results of numerous social surveys conducted at major airports in several countries has derived the curves shown in Figure 1 relating degree of annoyance and percent of population affected with noise exposure expressed in NEF. A survey conducted in the Netherlands (Ref. 4) investigated the relationship between the CNR (an approximate conversion of NEF is shown) and the percentage of those questioned who suffered feelings of fear, disruption of conversation, sleep or work activities (Figure 2).



ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL COMMUNITIES NEAR MAJOR AIRPORTS

Figure 1



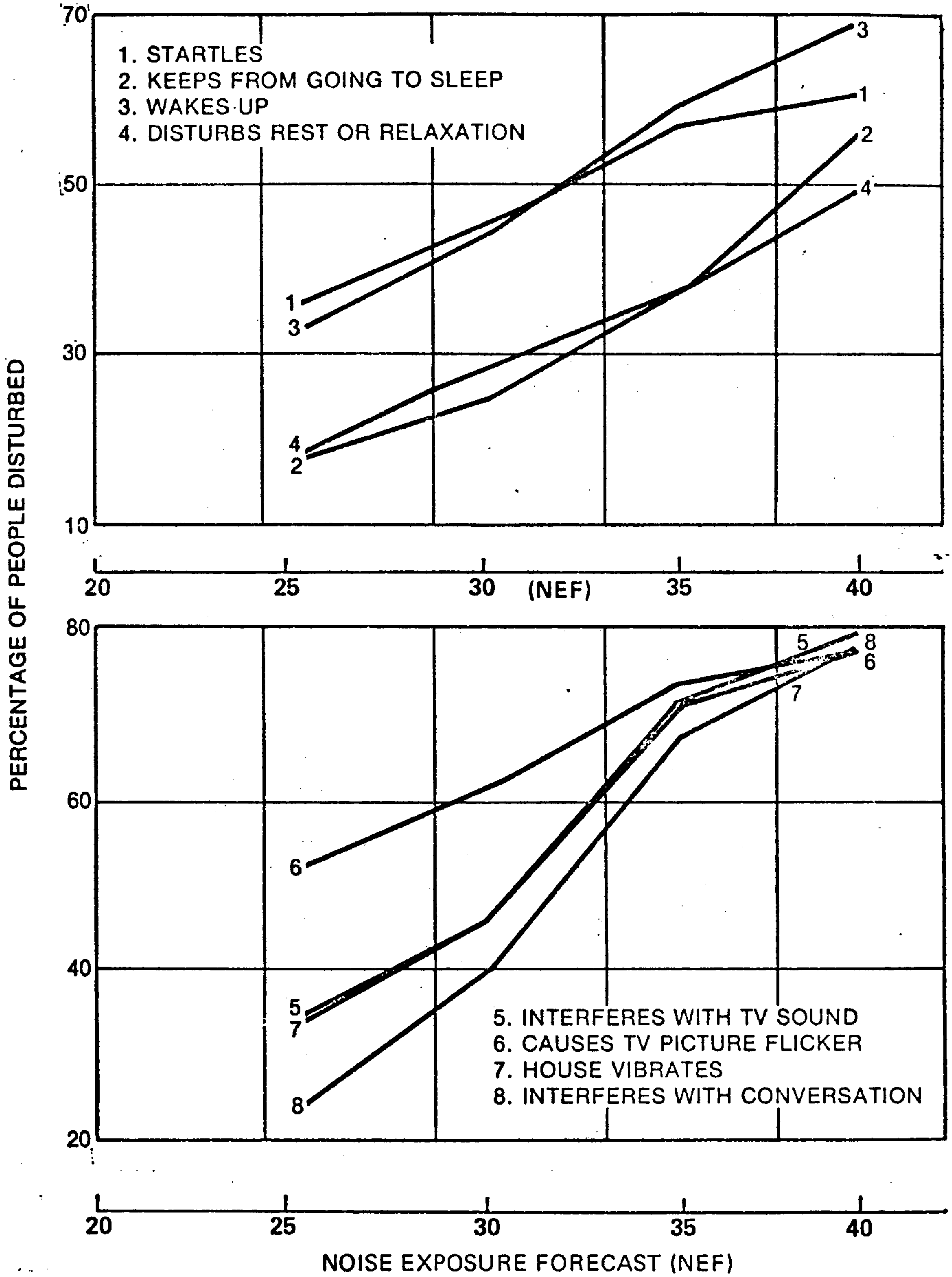
COMMUNITY RESPONSE TO AIRCRAFT NOISE-NETHERLANDS SURVEY

Figure 2

In 1960 the "Wilson Committee" was appointed by the British Government to investigate the nature, sources and effects of the problem of noise. The final report published in 1963 (Ref. 5) included results of extensive examination of community response to aircraft operations at London Heathrow Airport. Figure 3 adapted from that report shows the relationship between noise and NEF (the approximate conversion of NNI to NEF or Ldn was given earlier), and percent of population distrubed in various activities including sleep, relaxation, conversation and viewing television. Disturbance categories for startle and house vibration are also included.

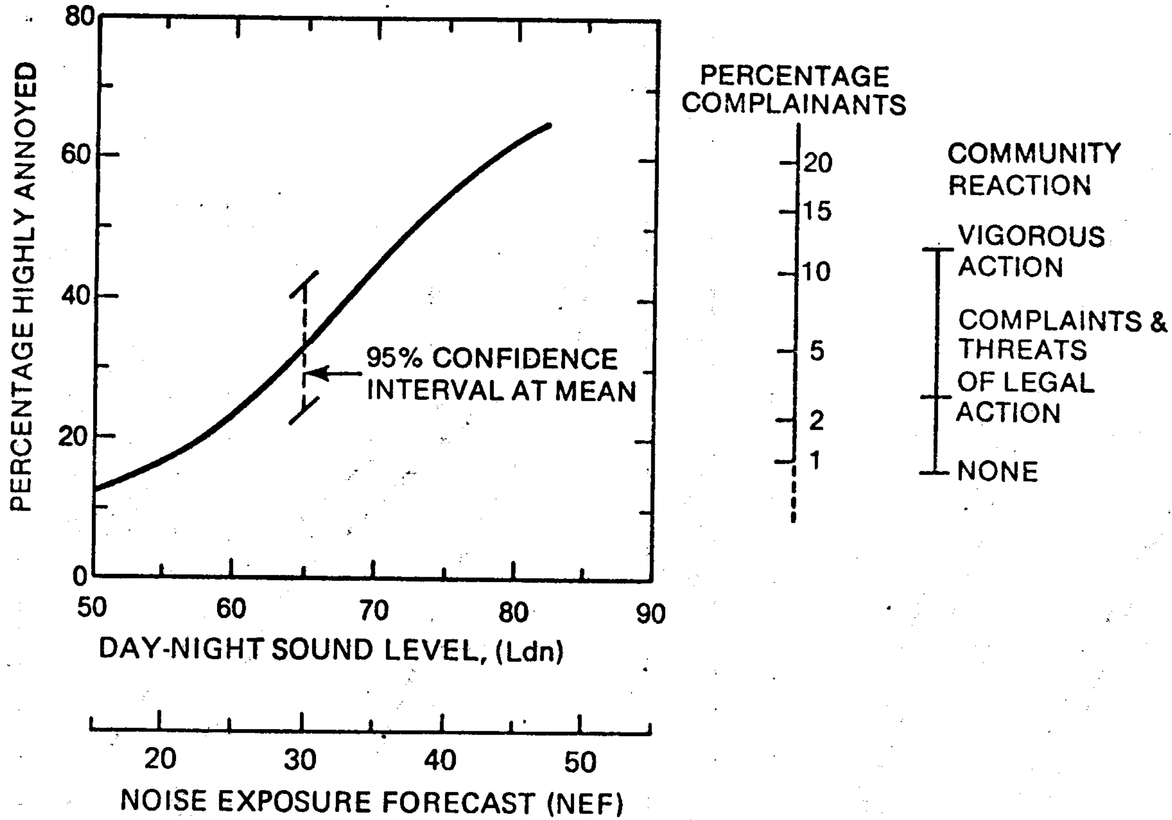
The Environmental Protection Agency publication "Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety" (Levels Document, Ref. 6), provides a relationship between the percent of population highly annoyed and the Day-Night Sound Level (Ldn). These data are shown in Figure 4 along with the relationship between annoyance, complaints and community reaction.

The EPA "Levels Document" describes the relationship between speech interference and Day-Night Sound Levels as shown in Figure 5. In going from NEF 30 to NEF 40 there is an increase in speech interference of nearly 90% outdoors. Indoor interference does not begin to appear until the NEF 35 level is reached.



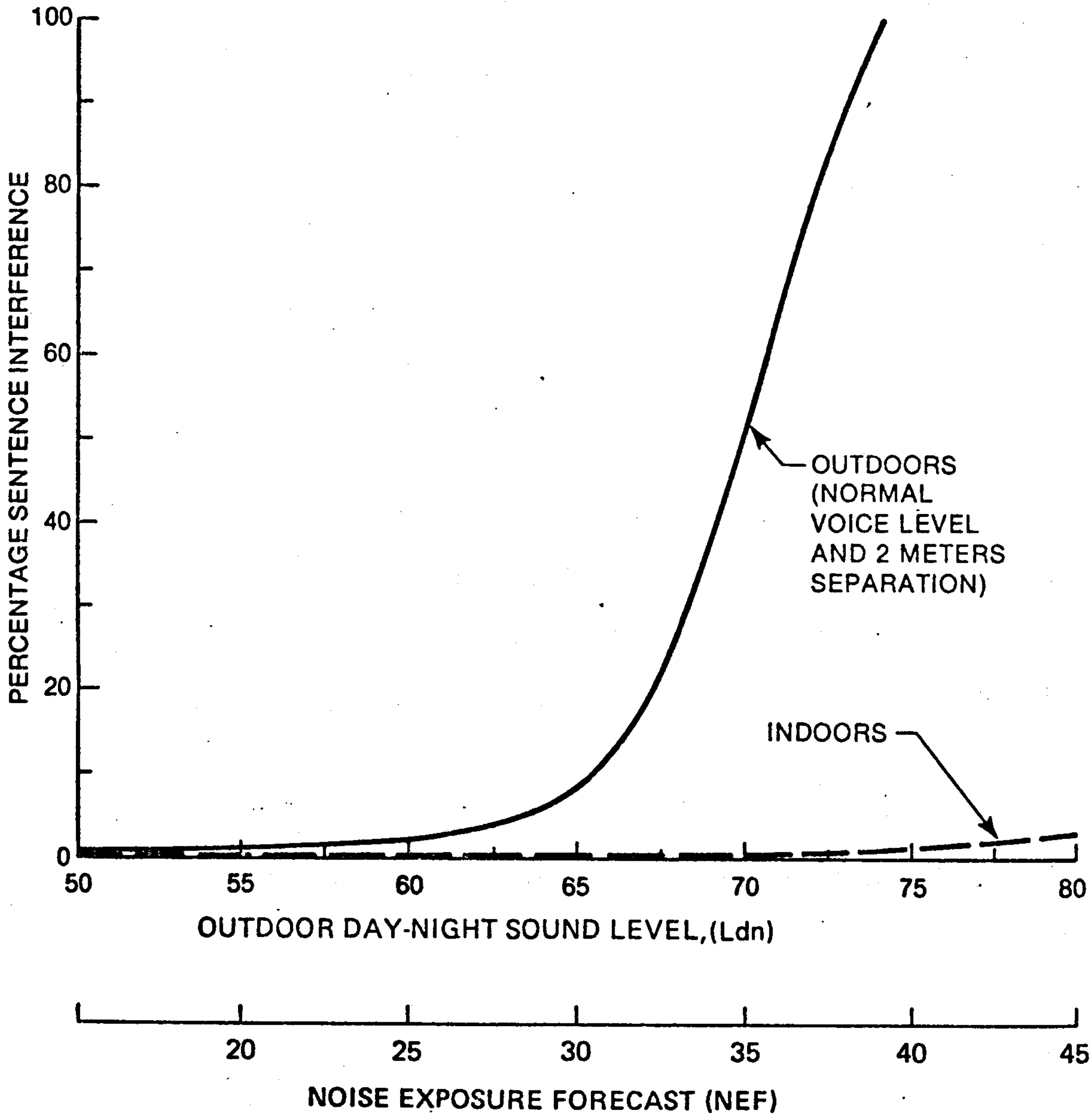
COMMUNITY RESPONSE TO AIRCRAFT OPERATIONS - LONDON HEATHROW AIRPORT

Figure 3



COMPARISON OF VARIOUS MEASURES OF INDIVIDUAL
ANNOYANCE AND COMMUNITY REACTION
AS A FUNCTION OF THE DAY-NIGHT SOUND LEVEL
(Ldn) AND NOISE EXPOSURE FORECAST (NEF)

Figure 4

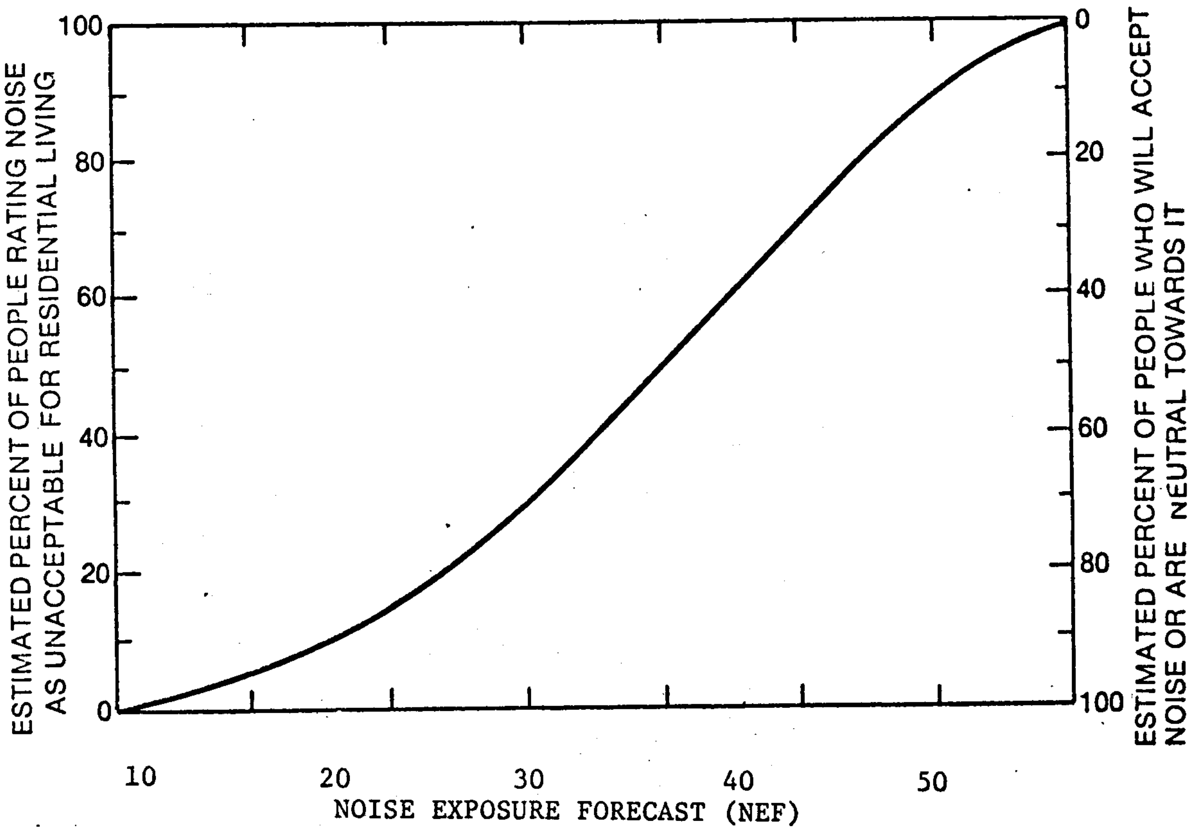


MAXIMUM PERCENTAGE INTERFERENCE WITH SENTENCES AS A FUNCTION OF THE DAY-NIGHT NOISE LEVEL. (PERCENTAGE INTERFERENCE EQUALS 100 MINUS PERCENTAGE INTELLIGIBILITY, AND L_{dn} IS BASED ON Lday + 3)

Figure 5

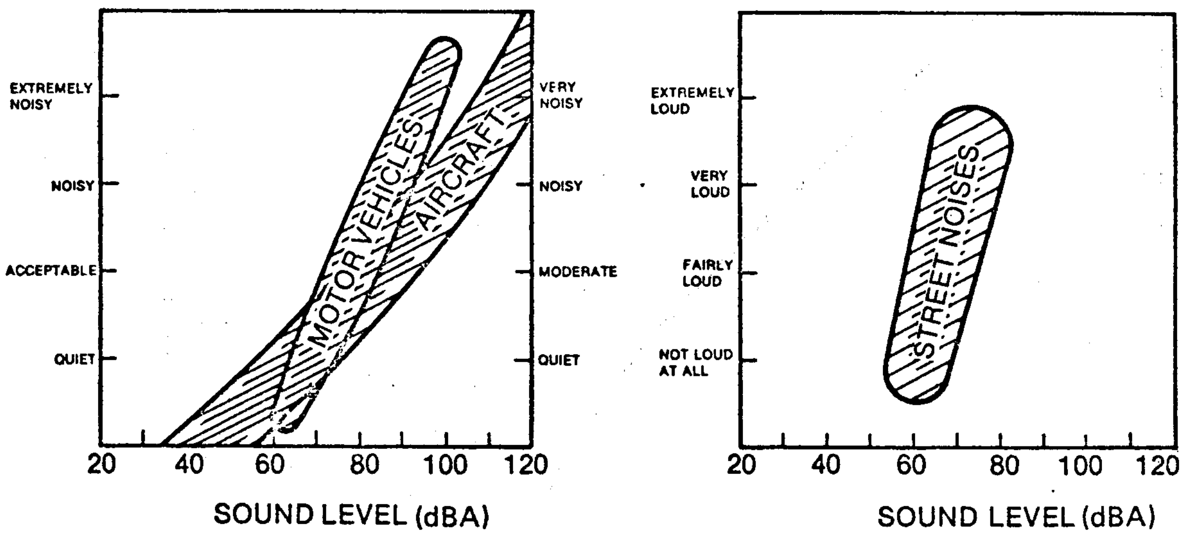
An investigation of attitudes to be expected from non-fear provoking noise in residential areas led Kryter to develop the curve shown in Figure 6. Although he expressed his findings in terms of CNR, the figure is expressed in NEF based on the approximate conversion of CNR to NEF as shown earlier. The figure also shows percent of population rating the noise associated with a given NEF level as acceptable or unacceptable.

The sound level (dBA, EPNdB, PNdB) associated with a single aircraft operation can be put in perspective by referring to the list of comparative sound levels for events encountered in daily life (Table I). In addition, studies have been conducted in which individuals have been exposed to aircraft fly-over noise and asked to make judgments with respect to the noisiness, loudness, annoyance or intrusiveness of the sound. Figure 7 taken from the "Wilson Report" shows comparative judgements between motor vehicles, aircraft and street noise. The variability in opinion associated with any sound level is represented by the vertical extent of the shaded area. Aircraft noise is apparently considered acceptable by some segment of the population at higher levels than those of other noise sources. Other data from the "Wilson Report" shown in Figures 8 and 9 relate dBA sound levels to ratings of intrusiveness and noisiness. A summary of that data is provided in Table II.



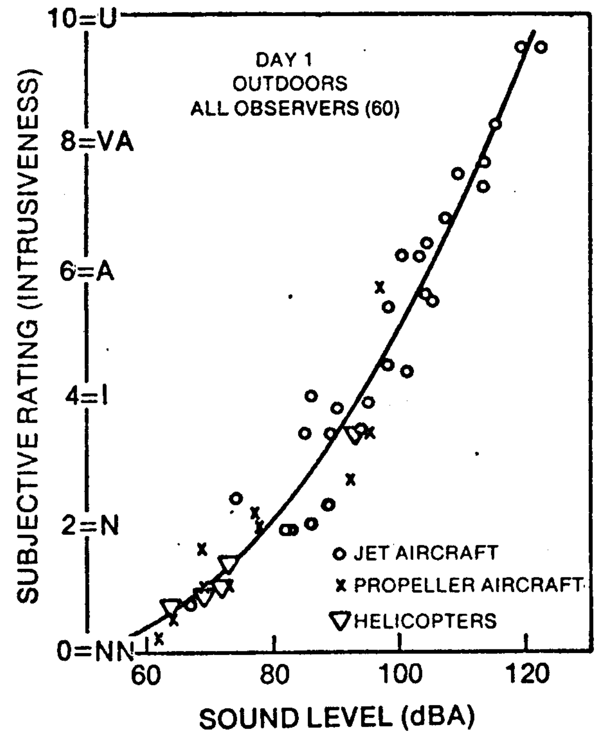
ATTITUDES TOWARD AIRCRAFT NOISE IN THE RESIDENTIAL COMMUNITY

Figure 6



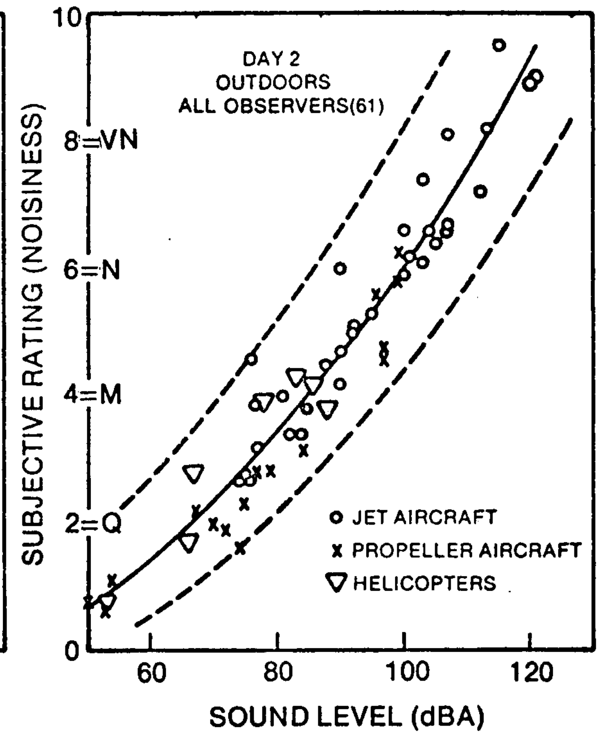
COMPARATIVE JUDGMENTS OF DIFFERENT NOISES

Figure 7



OUTDOOR JUDGMENTS ON THE CATEGORY SCALE OF INTRUSIVENESS PLOTTED AGAINST SOUND LEVEL A

Figure 8



OUTDOOR JUDGMENTS ON THE CATEGORY SCALE OF NOISINESS PLOTTED AGAINST SOUND LEVEL A

Figure 9

dBA	EPNdB	PNdB*	FIG. 31	FIG. 32	FIG. 33
120	133	131	EXTREMELY NOISY - VERY NOISY	UNBEARABLE	–
110	123	121	NOISY - VERY NOISY	VERY ANNOYING - ANNOYING	NOISY - VERY NOISY
100	113	111	NOISY	ANNOYING - INTRUSIVE	MODERATE - NOISY
90	103	101	MODERATE/ACCEPTABLE - NOISY	INTRUSIVE - NOTICEABLE	MODERATE
80	93	91	QUIET - MODERATE/ACCEPTABLE	NOTICEABLE	QUIET - MODERATE
70	83	81	QUIET	NOTICEABLE - NOT NOTICEABLE	QUIET
60	73	71		NOT NOTICEABLE	

* ASSUMING PNdB IS APPROXIMATELY EPNdB MINUS 2

RELATIONSHIP BETWEEN SINGLE EVENT AIRCRAFT NOISE LEVEL AND SUBJECTIVE RESPONSE

TABLE II

Existing Noise Criteria

Table III summarizes the relationship between various indicators of community annoyance and several cumulative noise indices. It also illustrates the point made earlier that a valid indicator of noise impact is the changing percentage of population associated with a given response category.

The Department of Transportation (DOT) has established Noise Standards and Procedures for use by State highway agencies and the Federal Highway Administration (FHWA) in the planning and design of highways (Ref. 7). Table IV shows the L_{10} values (the DBA levels exceeded 10% of the time for a 24 hour period) considered by FHWA as compatible with various land use categories.

The Department of Housing and Urban Development has published Noise Abatement and Control Standards (Circular 1390.2, August 4, 1971 - Ref.8) to encourage land utilization patterns for housing and other municipal needs. These standards are intended to separate uncontrollable noise sources from residential and other noise sensitive areas, and prohibit HUD

NEF	L_{dn}	ASDS	ANNOYANCE RESPONSE CATEGORIES A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	EPA LEVELS DOCUMENT	ELIGIBILITY FOR HUD SUPPORT
20	55	APPROX. 1 MINUTE	5%	20%	75%	17%	5%	1%	0%	25%	10%	20%	5%	22%	41%	20%	8%	17%	100%	10%	90%		≤NEF 30 ACCEPTABLE
30	65	2 MINUTES	27%	38%	35%	55%	21%	8%	4%	45%	25%	44%	28%	45%	61%	45%	39%	33%	90%	30%	70%	OUTDOOR ACTIVITY INTERFERENCE AND ANNOYANCE	NEF 30 - NEF 40 DISCRETIONARY
40	75	APPROX. 40 MINUTES	69%	25%	6%	80%	43%	22%	16%	60%	56%	69%	50%	79%	78%	78%	79%	54%	0%	60%	40%	POTENTIAL HEARING LOSS	≥ NEF 40 UNACCEPTABLE

PERCENT OF POPULATION:

A-SERIOUSLY ANNOYED
B- ANNOYED
C-NOT ANNOYED

(FIG. 25/ REF. 21)

D-EXPRESSING FEAR
E-EXPERIENCING SPEECH INTERFERENCE
F-EXPERIENCING SLEEP INTERRUPTION
G—DISTURBED AT WORK

(FIG. 26/REF. 24)

PERCENT OF POPULATION:

H-STARTLED
I- KEPT FROM GOING TO SLEEP
J- AWAKENED
K-DISTURBED WHILE RESTING OR RELAXING
L-INDICATING INTERFERENCE WITH TV SOUND
M-INDICATING PICTURE TUBE FLICKER
N-INDICATING HOUSE VIBRATION
O-EXPERIENCING INTERFERENCE WITH CONVERSATION

(FIG. 27/REF. 25)

P-PERCENTAGE HIGHLY ANNOYED
Q-% SPEECH INTELLIGIBILITY

(FIG. 28/ REF. 26)

R-PERCENT RATING NOISE AS UNACCEPTABLE
S-PERCENT RATING NOISE AS ACCEPTABLE

(FIG. 32/REF. 24)

*USING EQUIVALENCIES
NEF 20 = CNR 85
NEF 30 = CNR 100
NEF 40 = CNR 115

RELATIONSHIP BETWEEN CUMULATIVE NOISE LEVEL AND INDICATORS OF COMMUNITY ANNOYANCE

TABLE III

TABLE IV

FHWA

DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

Design Noise Level - L_{10}	Description of Land Use Category
60 dBA (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
70 dBA (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
75 dBA (Exterior)	Developed lands, properties or activities not included in categories A and B above.
55 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

support for new construction on sites having unacceptable noise exposure. Set out below are the HUD criteria for funding new residential construction.

RATING	DISPOSITION IN HUD
less than 30 NEF	Acceptable
30 to 40 NEF	Discretionary
more than 40 NEF	Unacceptable

The Environmental Protection Agency has also identified noise levels considered requisite to protect health and welfare with an adequate margin of safety. Table V summarizes the EPA findings in terms of Ldn. (As mentioned above, the difference between Ldn and NEF is approximately 35 - e.g., Ldn 65 equals NEF 30).

TABLE V

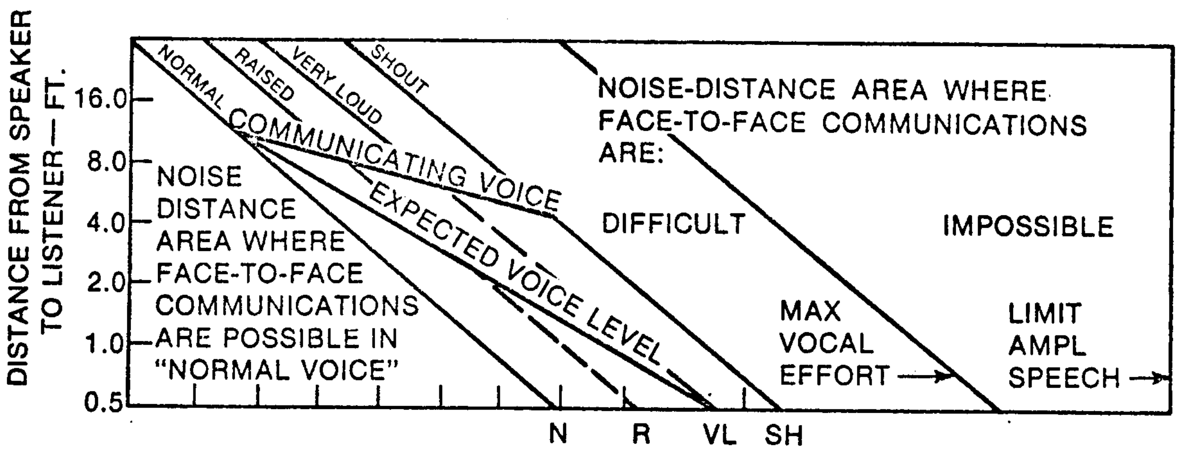
SUMMARY OF NOISE LEVELS IDENTIFIED AS REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY
(Ref. 6)

Effect	Level	Area
Hearing Loss	Ldn $\leq$ 74 dB	All areas
Outdoor activity interference and annoyance	Ldn $\leq$ 55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	Ldn $\leq$ 59 dB	Outdoor areas where people spend limited amounts of time, such as school yards, play-grounds, etc.
Indoor activity interference and annoyance	Ldn $\leq$ 45 dB	Indoor residential areas
	Ldn $\leq$ 49 dB	Other indoor areas with human activities such as schools, etc.

NOTE: All Leq values from Reference 6 converted to Ldn for ease of comparison (Ldn equals Leq (24) + 4 dB)

A major complaint raised in conjunction with aircraft noise is interference with talking and listening. This effect has been substantiated in numerous studies of noise complaint data. Figure 10 shows the relationship between speaker-listener separation and ambient sound level necessary for speech communication at various noise levels (Ref. 4). The horizontal axis is calculated in a variety of units, rank-ordered from best to worst in terms of predicting speech interference. The PSIL is the average sound pressure level in the octaves centered at 500, 1000 and 2000 Hertz while the SIL takes the average over three octaves from 600 to 4800 Hertz. In Figure 11, the EPA provides a similar format for gauging speech interference. It is important to note that the dBA and SIL (as well as other indices) are not accurate measures of the masking of speech by noise containing intense low frequency components. It has been shown that if a low frequency noise is sufficiently intense it can mask speech completely. For example, a sound pressure level of 115 dB at 50 Hertz will provide a 10 to 30 dB masking effect through 3000 Hertz.

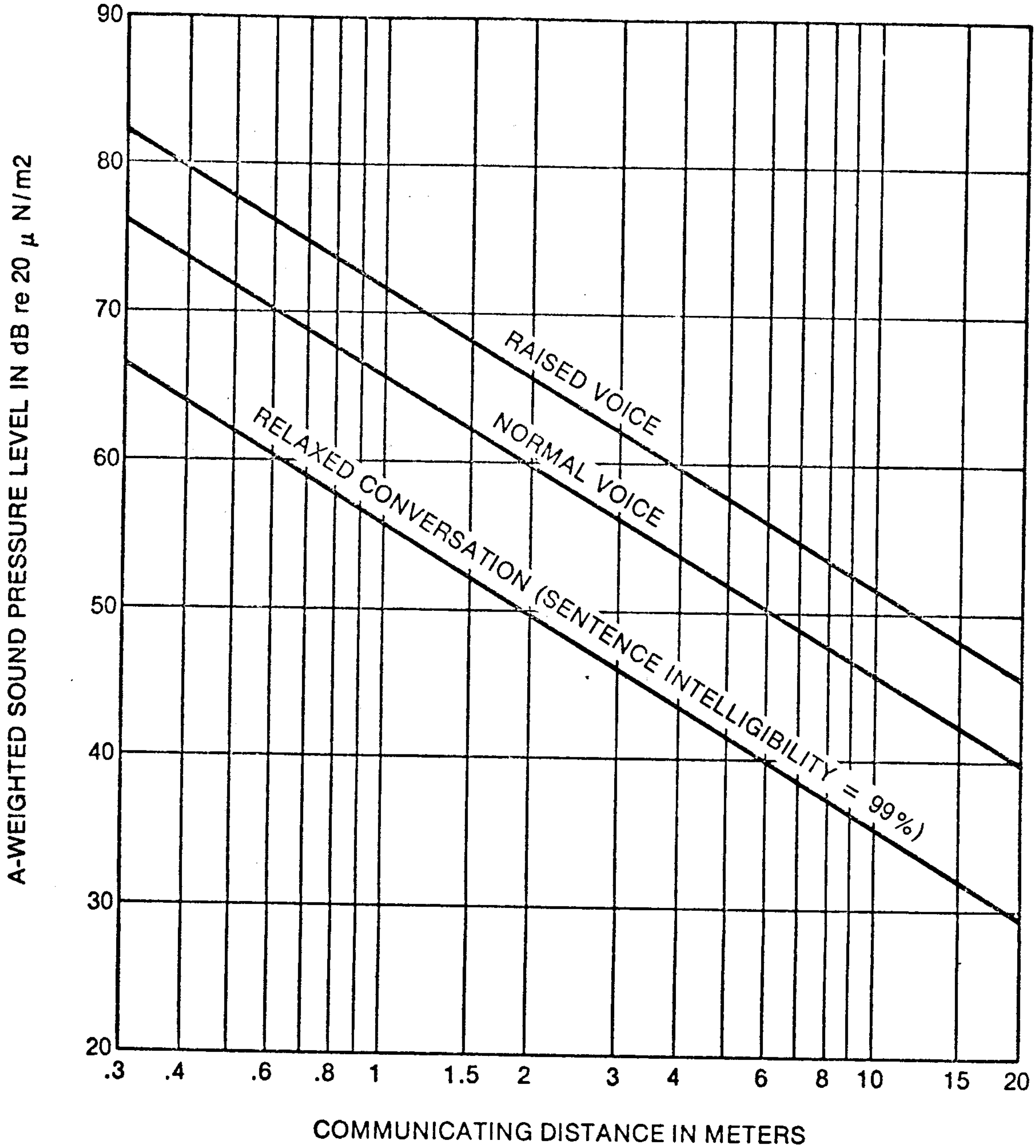
Applying these speech interference criteria (Figures 10 and 11) to aircraft noise, outdoor communication at a distance of



PSIL	40	50	60	70	80	90	100	110	125
SIL	37	47	57	67	77	87	97	107	122
dB(A)	47	57	67	77	87	97	107	117	132
PNdB	60	70	80	90	100	110	120	130	145
dB(C)	54	64	74	84	94	104	114	124	139

RELATIONSHIP BETWEEN SPEAKER-LISTENER SEPARATION, AMBIENT SOUND LEVEL AND ABILITY TO COMMUNICATE

Figure 10



MAXIMUM DISTANCES OVER WHICH CONVERSATION IS CONSIDERED TO BE SATISFACTORILY INTELLIGIBLE (SENTENCE INTELLIGIBILITY = 95% EXCEPT AS NOTED)

Figure 11

two (2) feet would require shouting for those persons within the 100 EPNdB single event footprints. This impact would last for the duration of the noise at this level, up to 30 seconds.

The Occupational Safety and Health Administration of the Department of Labor has established noise standards to protect the health and safety of industrial workers (29 CFR 1910.95). Shown below are the permissible noise exposure times for sound levels of 90 dBA and greater.

DURATION PER DAY, HOURS	SOUND LEVEL dBA SLOW RESPONSE
8	90
6	92
4	95
3	97
2	100
1 -1/2	102
1	105
1/2	110
1/4 or less	115

EPA has recommended that 85 dBA be established as the level not to be exceded when an individual is exposed to noise for an eight-hour work day.

Residential structures generally provide 15 to 20 dBA attenuation. Consequently the indoor noise level shown by the 100 EPNdB (85 dBA) contours would be in the range of 65 to 70 dBA. At this level of noise there would be no interference with normal communication at a distance of three (3) feet. At eight (8) feet communication would require a raised voice.

Hearing Damage

Studies of the temporary auditory threshold shift or temporary hearing loss caused by noise exposure have demonstrated several important facts related to temporary threshold shifts (Ref. 12). Some of those facts are:

1. The temporary elevation of auditory threshold which results from one day of exposure (8 hours) to noise levels of 100 dBA or more may vary from no shift to a temporary 40 dB shift depending on individual susceptibility.

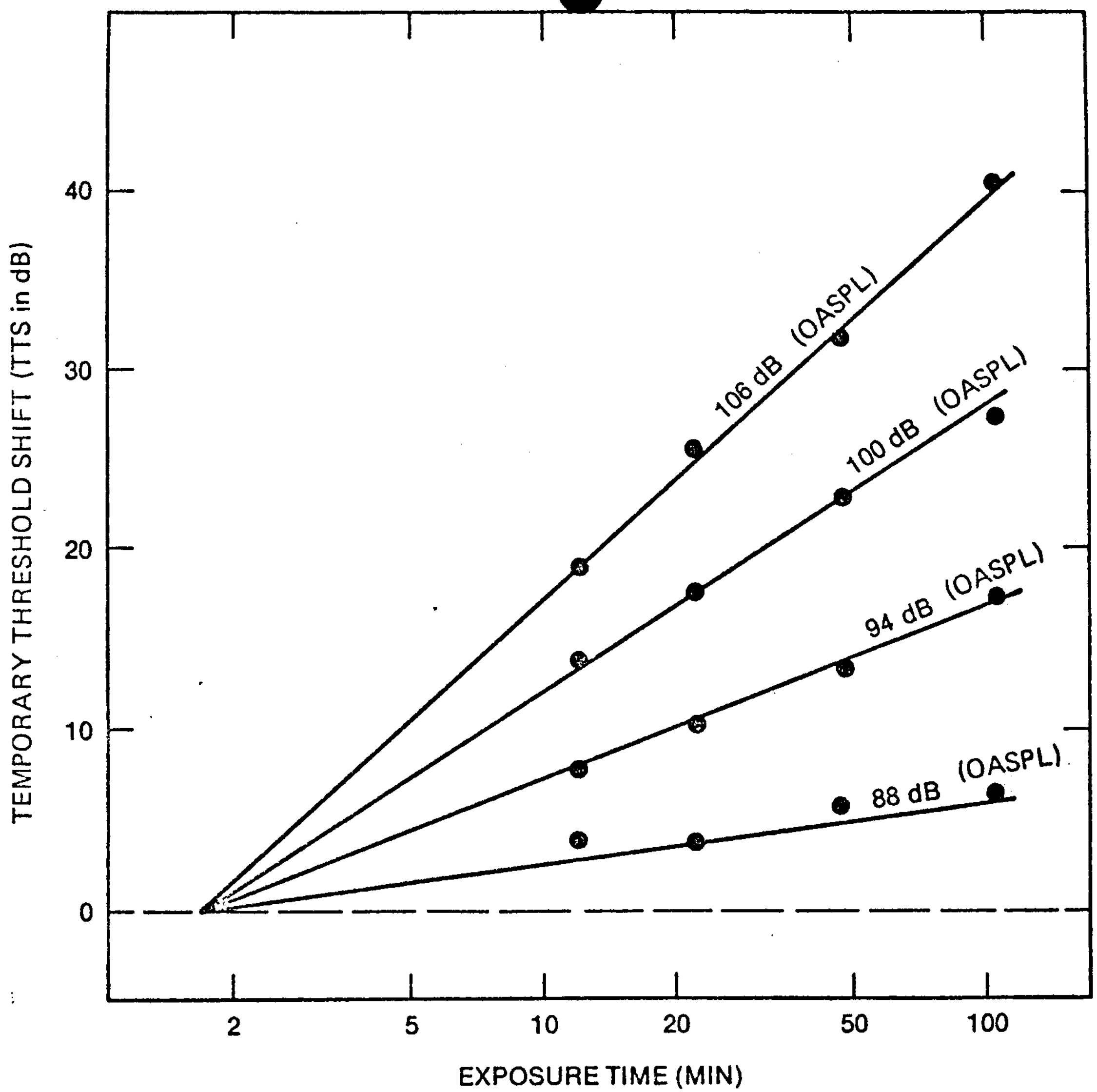
2. Exposure to typical industrial noise produces the largest temporary hearing loss at 4000 to 6000 Hertz.

3. Recovery from temporary or transient hearing loss generally occurs within the first hour or two after the noise exposure has ended.

4. Efforts have been made to predict susceptibility to noise-induced permanent hearing loss on the basis of the amount of temporary threshold shift. A study of the various tests for detecting highly susceptible ears has indicated that there is no test which will predict susceptibility to noise-induced hearing loss.

Figure 12 shows the relationship between a temporary auditory threshold shift (TTS) in terms of level of exposure and exposure time. The "white noise" referred to in Figure 12 is comprised of equal sound pressure levels in each frequency component.

The EPA "Levels Document" discusses a temporary threshold shift hypothesis. This hypothesis states that "a temporary threshold shift measured two minutes after cessation of an eight hour noise exposure closely approximates the Noise Induced Permanent Threshold Shift (NIPTS) incurred after a 10 to 20 year exposure to that same level."



TEMPORARY THRESHOLD SHIFT (TTS) AS A FUNCTION OF EXPOSURE TO WHITE NOISE (OASPL - OVERALL SOUND PRESSURE LEVEL)

Figure 12

The EPA "Levels Document" also discusses the "Equal Energy Hypothesis." This hypothesis states "that equal amounts of sound energy will cause equal amounts of NIPTS regardless of the distribution of the energy across time." While there is some experimental confirmation of this hypothesis, certain types of intermittent sounds limit its application.

Long continued exposure to extensive noise can produce permanent hearing loss but the process is not well understood. It does not appear possible to directly equate the deleterious effects of noise-exposure and the energy content of the noise. That is to say, doubling the energy content in a noise does not produce double the hearing loss. It is assumed that the larger the total energy content of the noise the smaller the time of exposure required to produce the same amount of hearing loss, but the exact relation between time and noise energy is not known.

The total amount of hearing loss produced by noise-exposure depends on many variables. Hearing loss varies with the type of exposure and its degree of intermittency, the susceptibility of the individual exposed, the total duration of the exposure, and possible induced auditory fatigue generated by the totality of exposure in terms of type, degree and duration.

Other Effects of Noise on Humans

It is important to emphasize that many researchers are not convinced that noise exposure can be correlated to any real medical problem. The New York City Mayor's Task Force on Noise Control (Ref. 9) reported, "To date, virtually no properly designed formal studies have been published, documenting the palpable indirect effects of noise pollution upon man. Although we may again appeal to personal experience, having been aware of fatigue, distraction, irritation or inefficiency ostensibly precipitated by or aggravated by noise, the tangible nature of these effects vanishes as soon as it is pursued in the laboratory or in formal field studies." However, there is still considerable debate as to whether noise can cause health defects of a non-auditory nature.

Many researchers underscore the need for extensive epidemiological noise surveys concerned with the incidences of acute and chronic ailments in different work groups. Whatever correlation there may arguably be between noise and adverse health effects requires far more definite, controlled tests to demonstrate a cause-effect relationship.

Some studies indicate that it is not necessary to be fully awakened by noise to suffer the consequences in terms of physiological fatigue. Research by H. R. Richter concluded that "noise associated with modern civilization and even natural sounds frequently disturb the rest of sleepers without their awareness" (Ref. 10).

After protracted periods of exposure to intense noise, particulary of high frequency, animals have shown marked depletion of adrenal constituents. This indicates that their physiological tolerance or ability to adapt to stressful situations has been exceeded. Under these conditions, gastroduodenal ulcers and other pathological changes in the liver and kidneys are possible. It is plausible to expect similar findings in man, but neither the levels nor the exposure conditions required to exceed human physiological tolerance to noise are known.

Noise has been reported to cause vasoconstriction, fluctuations in arterial blood pressure, and even alterations of some functional properties of cardiac muscle. Vasoconstriction of the small arterioles of the extremities occurs with noise exposures of moderate level (about 70 dB) and can become progressively stronger with increasing noise intensity.

N. N. Skatalou, a Russian scientist who studied 589 factory workers, found effects of noise on cardiovascular systems varied with the type of exposure. Steady or continuous noise resulted in "arterial tension, doward trend in venous pressure and reduced peripheral resistance." Intermittent noise, on the other hand, caused "hypertension, rising arterial pressure and frequent capillary spasms" (Ref. 10).

The views of several physicians concerned with the adverse physiological impact of noise were summarized by Baron (Ref. 2). Dr. G. Jansen found that blood circulation does not adapt to continuing exposure to noise by a return to its initial level. Instead, peripheral blood flow continues to be reduced as a result of continuing vasoconstriction and increased resistance. This phenomenon begins at 60-70 dB and becomes more pronounced as sound intensity increases. Dr. L. E. Farr summarized his views of the effects of noise in the following way: "In disease states such as anxieties, duodenal ulcers and other so-called tension ills, the additive, deleterious effect of noise is real and immediate" (Ref. 2).

REFERENCES FOR APPENDIX F

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2. Baron, Robert A. THE TYRANNY OF NOISE. New York, St. Martins Press, 1970, 294 p.

3. Tanner, C. S., R. E. Glass. ANALYSIS OF OPERATIONAL NOISE MEASUREMENTS IN TERMS OF SELECTED HUMAN RESPONSE NOISE EVALUATION MEASURES. Hydrospace Research Corporation, Dec. 1971.

4. Kryter, Karl D. THE EFFECTS OF NOISE ON MAN. New York, Academic Press, 1970, 633 p.

5. Great Britian. Communittee on the Problem of Noise. NOISE, FINAL REPORT; presented to Parliament by the Lord Minister for Science by Command of Her Majesty. London, H. M. Stationery Office, Jul. 1963, p.

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7. Department of Transportation Policy and Procedures Memorandum 90-2, Feb. 8, 1973

8. Department of Housing and Urban Development, Circular 1390.2, Aug. 4, 1971

9. New York (City), Mayor's Task Force on Noise Control. TOWARD A QUIETER CITY. 1970, 56 p.

10. Newman, J. S. SUBJECTIVE COMMUNITY REACTIONS TO CONSTRUCTION NOISE. Presented at NOISExpo Convention, Chicago, Ill., Oct. 1973

11. U.S. Environmental Protection Agency, Washington, D.C. NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS. Federal Register, v. 36, no. 84, Apr. 30, 1971, p. 8186-8201

12. Glorig, Aram. HEARING CONSERVATION IN INDUSTRY. Maico Audiological Library Series, v. II, Report 3, 5p.

APPENDIX G: COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

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

JAN 24 1975

OFFICE OF THE
ADMINISTRATOR

Mr. Charles R. Foster
Director, Office of Environmental Quality
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Foster:

We have reviewed your draft environmental impact statement (EIS) for Civil Airplane Fleet Noise Requirements, and are in agreement with the proposed action. Accordingly, we have assigned the EIS a rating of LO-1 (lack of objections, adequate information).

We encourage the Federal Aviation Administration to promptly complete their deliberations on the various details of the proposed regulation and promulgate the rule as soon as possible.

Sincerely yours,

Sheldon Meyers

Sheldon Meyers
Director
Office of Federal Activities

Form DOT F 1320.1 (1-67)

UNITED STATES GOVERNMENT

Memorandum

DEPARTMENT OF TRANSPORTATION

OFFICE OF THE SECRETARY

DATE: January 20, 1975

In reply refer to:

SUBJECT: Draft Environmental Impact Statement: FAA - Civil Airplane Fleet Noise Requirements

FROM : Director, Office of Environmental Affairs
TES-70

TO : Director of Environmental Quality
FAA/AEQ-1

We appreciate the opportunity to review and comment on this draft environmental impact statement. We have no specific comments to offer on the statement.

We look forward to receiving the final environmental impact statement, including the comments received from other public agencies and the general public on the draft statement.

Marty

Martin Convisser

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

December 23, 1974

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

Dear Chuck:

I have reviewed the Draft Environmental Impact Statement for a proposed Federal Aviation Regulation which would establish noise standards for all turbojet aircraft with takeoff gross weight of 75,000 pounds, or greater and have no comments.

Sincerely,

W. A. Leasure, Jr.
Acting Chief
Applied Acoustics Section
Mechanics Division, IBS

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

JAN 24 1975

OFFICE OF THE ASSISTANT SECRETARY
FOR COMMUNITY PLANNING AND DEVELOPMENT

IN REPLY REFER TO:
CSP

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

This is in response to your request for comments on the draft Environmental Impact Statement (EIS) for the proposed rule on "Civil Airplane Fleet Noise Requirements." We commend your office on the completeness of the cost/benefit analysis of the sound absorption material (SAM) treatment program for subsonic turbojet aircraft over 75,000 pounds. We ask, however, if the same treatment and improvement would be achieved if applied to aircraft less than 75,000 pounds. These lighter aircraft, often operating from general aviation airports, are contributing to aircraft noise exposure in many of our suburban and rural areas.

It appears that the proposed strategy, coupled with operation procedure alternatives, will substantially reduce the noise impact around air carrier airports. It also appears that the refan program when applied to certain aircraft would provide additional benefits, and we would urge that work continue to develop this retrofit strategy.

The SAM retrofit program and rule will have its greatest benefit in most densely settled urban areas where land use measures to reduce aircraft noise-community conflicts can be achieved only at a large cost and community disruption. As stated in the EIS (page 42) compatible land use planning and development should be enhanced by the fleet noise rule. In our densely settled urban areas, reduced noise at the source will provide a large measure of relief for residents now living around airports as well as making available needed housing sites which are now considered unacceptable because of aircraft noise.

This Department endorses the proposed aircraft fleet noise requirements and believes that the EIS considers adequately the environmental impact of promulgating a retrofit rule.

Sincerely,

D.O. Meeker

David O. Meeker, Jr. FAIA
Assistant Secretary

CIVIL AERONAUTICS BOARD
WASHINGTON, D.C. 20428

IN REFER REPLY TO: B-1-68

January 23, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D. C. 20591

Dear Mr. Foster:

With regard to your request for comment on the Draft Environmental Impact Statement of a proposed Federal Aviation Regulation to establish aircraft noise standards, the Board suggests that adoption of the proposed regulation be deferred until a comprehensive analysis of the economic impact on the airlines is made to determine whether or not a retrofit program to accomplish the objectives of the proposed regulation is economically feasible.

Aside from the initial expense of an estimated 650 to 750 million dollars for SAM retrofit kit installation, the means of payment for which has yet to be determined, other economic aspects of the proposed program must be considered.

The President's proposal to impose a $3.00 per barrel import tariff on imported crude oil, and a $3.00 per barrel excise tax on domestic crude oil production equates to 7.5 cents per gallon increase in the price of aircraft jet fuel. Based on the certificated airline fuel consumption of about 9 billion gallons per year, airline fuel costs would increase by 675 million dollars yearly. It has also been proposed that all domestic crude oil production be decontrolled, which would allow "old" crude oil now selling at $5.25 per barrel to rise to equal the price of "new" crude oil production priced at about $10.25 per barrel. About 59 percent of the total domestic crude oil production is from "old" wells. A $5.00 increase per barrel in the price of old crude equates to a 12.5 cents per gallon increase in the price of jet fuel, which, when applied to 59 percent of the 9.0 billion gallon airline industry consumption, creates a further added fuel cost of over 678.5 million dollars per year.

If, as estimated in the draft proposal, the retrofit program would result in an increase in air carrier fuel consumption of 4,000 barrels per day, a further increase in cost of about 21.6 million dollars per year, based on the current jet fuel price of 23.8 cents per gallon and the 7.5 cents per gallon increase resulting from the proposed tax and tariff, would be incurred.

Additionally, direct operating costs are estimated to increase by an amount ranging from 9.0 to 12 percent per year upon completion of the retrofit program. In the 12-month period ended September 30, 1974, the direct operating costs of the U.S. certificated air carriers were 6.858 billion dollars. A 9.0 percent increase in direct operating costs applied to the 67 percent of the airline fleet aircraft considered to be candidates for retrofit would result in an increased cost to the airlines of over 413.5 million dollars yearly, which would prevail each year throughout the remaining life of each aircraft after retrofit.

Further, the economics of a decrease in productivity resulting from a weight or range penalty inherent in the retrofit program is a prime consideration, as is evidenced by the B707-300B aircraft which would gain about 3,450 pounds in weight for a loss of 17 passenger seats with a probable 9.0 percent increase in direct operating costs and a potential for over a 10 percent loss in revenue.

Under the Federal Aviation Act of 1958, the Federal Aviation Administration is charged with the responsibility to assure that any proposed regulation or standard must be economically reasonable. The Civil Aeronautics Board is also subject to the same requirement, and for that reason proposes that operational procedures and normal airline aircraft attrition be continued as the principal means of aircraft noise abatement until a full analysis of the economic impact on the airlines of the proposed retrofit program is completed. In view of the recent developments in fuel cost and conservation as outlined in the President's addresses to the nation on January 13 and 15, 1975, such an analysis is of paramount importance.

The potential adverse economic impact on the U.S. airline industry of the contemplated actions as delineated herein is of such magnitude that the Board's staff has been directed to analyze the economic effects on the U.S. certificated air carrier industry on an expedited basis.

Sincerely,

Richard J. O'Melia

Richard J. O'Melia
Acting Chairman

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER 75/4

JAN 27 1975

Dear Mr. Foster:

Thank you for your letter of December 9, 1974, transmitting copies of the Federal Aviation Administration's draft environmental statement for civil airplane fleet noise requirements.

Our comments are presented according to the format of the statement or by subject.

We believe the draft statement is well done. The discussion under II.--Probable Impact of the Proposed Action on the Environment Dealing with "Noise Benefits" and "Fuel Consumption" is objective, quantitative, and rigorous. The conclusions reached from the discussion represent a balanced view.

We suggest a statement be added to the final statement indicating biotic natural resources were considered in the establishment of the proposed regulations. Noise levels are often critical to certain pressure-sensitive wildlife species on a local basis.

We note that on page 13, the draft statement indicates ". . . possible negative effects on other aspects of the environment are addressed." We suggest all significant environmental impacts should be discussed, as the quotation from the draft statement appears to make a value judgment about effects.

Also, the discussion and analysis of "Emissions" are sketchy and the conclusions reached on air pollution levels are not supported by a rigorous analysis of data. While we do not take issue with the conclusions reached on air pollution emissions, we suggest these conclusions are not supported by analysis of presented facts.

We hope these comments will be helpful to you in the preparation of a final statement.

Sincerely yours,

Stanley D. Doremus

Deputy Assistant Secretary of the Interior

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20591

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

JAN 24 1975

REPLY TO ATTN OF: RL

Mr. Charles R. Foster
Director
Office of Environmental Quality
Federal Aviation Administration
Washington, DC 20591

Dear Chuck:

We have reviewed the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements dated December 1974. Our comments follow.

1. The section "Alternatives to the Proposed Action" should state the criteria used to make the determination of economic reasonableness of the various technological options for noise reduction. Economic reasonableness is a key issue to decision making in this area. We think this section should include the values of such factors as maximum acceptable cost, minimum acceptable number of people benefited by a selected amount of noise reduction, acceptable values of cost effectiveness, etc., that were used in the decision making process, and the rationale for selecting the values.

2. Figures III-1 and III-2 in this section may be misleading in an environmental impact statement on retrofit. The inclusion of operational procedures has a substantial impact on the areas removed from any given level of noise exposure. Therefore, since these procedures are not required by the FAA, the results obtained using them may be misleading. In particular the points through which the curves are drawn in Figures III-1 and III-2 are not points corresponding to the options of interest in this impact statement.

Sincerely,

Harry W. Johnson

cc:

H. Safeer/FAA, Office of Environmental Quality

FEDERAL ENERGY ADMINISTRATION
WASHINGTON, D.C. 20461

1975

OFFICE OF THE ASSISTANT ADMINISTRATOR

FEA 74-115

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Foster:

This is in response to your request for our review and comment on the draft environmental impact statement for Civil Airplane Fleet Noise Requirements. Our comments are presented according to subject.

Fuel Consumption

During the next decade or so the 727 will be the mainstay of the industry due to its versatility. Also during the next decade airlines will probably be replacing most of the B 707's and the D.C. 8's in their fleet. This is due to the high operating costs, limited routes and relatively small number of seats. These two planes are also the worst noise offenders in the fleet and would incur the highest fuel increase after retrofit, 1.4% and 1.0%, respectively. The 727 by comparison would incur a 0.2% fuel increase. The 727, 737, and D.C. 9 combined make up 77% of the fleet.

Consideration should be given to relaxing the proposed standards to exclude all presently operating 3 engine jets (727, 737, and D.C. 9). A comparison of the FAR limits in table II on page 15 shows that the 727, 737, and D.C. 9 either meet or approach all FAR limits on take-off, sidelines, and landing.

Because the greatest noise offenders are the jets with four engines (D.C. 8 and 707), a retrofit program for only 4 engine jets in operation after June 30, 1979, would be appropriate. This would have the effect of speeding up their retirement from fleets and thus avoiding the increased installation cost and fuel consumption associated with the muffler system for most of these planes. Only the 4 engine jets still in use after June 30, 1969 would be required to install the muffler system. This would result in the elimination of the worse noise offenders within a reasonable period of time.

We hope that our comments will be helpful to you in the preparation of the final impact statement and in your future consideration of the proposal.

Sincerely,

Roger W. Sant
Assistant Administrator
Energy Conservation and Environment

GEORGE R. ARIYOSHI
GOVERNOR

E. ALVEY WRIGHT
DIRECTOR

LAWRENCE F. C[illegible]HUN
DEPUTY DIRECTOR

MUNNY Y. M. LEE
DEPUTY DIRECTOR

DOUGLAS S. SAKAMOTO
DEPUTY DIRECTOR

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

AIRPORTS DIVISION

HONOLULU INTERNATIONAL AIRPORT • HONOLULU, HAWAII 96819

IN REPLY REFER TO:
AIR 9784

January 20, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

This is in reply to your letter of December 9, 1974 transmitting for comments the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements which would amend Part 36 of the Federal Aviation Regulations.

In general, we are in agreement with the analysis of the effect on the environment that would result from the proposed rule for nacelle treatment to reduce engine noise. To the best of our knowledge, the acoustic treatment of engine nacelles with sound absorbent materials appears to represent the best immediate solution to the urgent need to reduce aircraft noise at airports.

We are concerned with the reliance the impact statement places on the 23-airport analysis in Appendix C. In terms of total fleet cost, it is apparent that the refan retrofit program will be substantially more than SAM retrofit. However, 23 airports and the representative airport model of the analysis are principally large hubs with a greater number of JT3D equipped aircraft. We wonder whether a complete investigation including medium and small hub airports served by JT8D equipped aircraft might not show that the cost-benefit ratio would favor early implementation of a JT8D refan program.

We suggest additional clarification be provided in the EIS for Figures III-1 and III-2. An explanation is needed for the abbreviations used in the code column and the source of the data for the figure should be provided for reference purposes.

Thank you for the opportunity to review the draft environmental impact statement.

Very truly yours,

OWEN MIYAMOTO
Chief, Airports Division

TVASNAC

TOWN-VILLAGE AIRCRAFT SAFETY & NOISE ABATEMENT COMMITTEE

196 CENTRAL AVENUE • LAWRENCE, NEW YORK 11559
(516) 371-2330

TOWN OF HEMPSTEAD
Villages of
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CEDARHURST
EAST ROCKAWAY
FLORAL PARK
GARDEN CITY
HEMPSTEAD
HEWLETT BAY PARK
HEWLETT HARBOR
HEWLETT NECK
ISLAND PARK
LAWRENCE
LYNBROOK
NEW HYDE PARK
RUSSELL GARDENS
STEWART MANOR
VALLEY STREAM
WOODSBURGH
City of
LONG BEACH

CLIFFORD A. DEEDS
Director

January 13th, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D. C., 20591

Dear Mr. Foster:

Re: Environmental Impact Statement
Civil Airplane Fleet Noise
Requirements

We thank you for your transmittal letter of 9 December 1974, together with draft Environmental Impact Statement noted above.

We have studied the E.I.S. and find ourselves in agreement with it. On the basis of this E.I.S. we see no reason for further delay in instituting immediately the Civil Airplane Fleet Noise Requirements regulation.

Very truly yours,

Clifford A. Deeds
Director

CAD:dt

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Department of Transportation

State of Georgia
No. 2 Capitol Square
Atlanta, Georgia 30334

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COMMISSIONER
EMORY C. PARRISH
DEPUTY COMMISSIONER

THOMAS D. MORELAND
STATE HIGHWAY ENGINEER
W. M. WILLIAMS
SECRETARY-TREASURER

December 27, 1974

File No. 270

Mr. Charles R. Foster, AEO-1
Director of Environmental Quality
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

Subject: Draft Environmental Impact Statement, Noise

Thank you for the opportunity to comment on the draft environmental impact statement regarding civil airplane fleet noise requirements We strongly agree with your suggestion of retrofitting nacelles and fan ducts with sound absorbing materials. This is of special importance as airlines strive to extend the useful life of their fleets.

We look forward to the many benefits resulting from quieter aircraft operations.

Very truly yours,

Floyd E. Hardy, P. E., Chief,
Environmental Analysis Bureau

RRB/ch

INCORPORATED
VILLAGE OF HEWLETT NECK
NASSAU COUNTY, N. Y.
30 PIERMONT AVE., HEWLETT, N. Y. 11557
TELEPHONE: (516) 295-1400

FROHMAN HOLLAND, MAYOR

January 14, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

I am familiar with the Environmental Impact Study recently issued by the FAA.

Our Village along with many others have suffered much from aircraft noise.

The implementation of retrofit rules should go far in giving our residents the relief they have long sought.

An early enforcement of such regulations would be most welcome and appreciated.

Sincerely,

FROHMAN HOLLAND
Mayor
Inc. Village of Hewlett Neck

FH/dw

Village of Hewlett Bay Park

30 PIERMONT AVENUE, HEWLETT, L. I., NEW YORK 11557

TELEPHONE: (516) 295-1400

MILTON S. RINZLER, MAYOR

January 14, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

I am familiar with the Environmental Impact Study recently issued by the FAA.

Our Village along with many others have suffered much from aircraft noise.

The implementation of retrofit rules should go far in giving our residents the relief they have long sought.

An early enforcement of such regulations would be most welcome and appreciated.

Sincerely,

MILTON S. RINZLER
Mayor
Inc. Village of Hewlett Bay Park

MSR/dw

OFFICE OF THE MAYOR
W TOM WARD
(516) 825-4200

VILLAGE HALL
ON THE VILLAGE GREEN

VALLEY STREAM,
NEW YORK 11580

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D.C. 20591

Re: Environmental Impact Statement Civil Airplane Fleet Noise Requirements

Dear Mr. Foster:

In keeping with sentiments expressed by Nassau County Villages, via TVASNAC and in separate expressions from the Villages involved, Valley Stream wishes to add evidence of its concern.

The contents of the Environmental Impact Statement on Civil Airplane Fleet Noise Requirements conforms with the convictions of this Village. This communication is to request immediate application of the Fleet Noise regulation.

Respectfully submitted,

W Tom Ward

W Tom Ward
14 January 1975: sas

INCORPORATED VILLAGE OF CEDARHURST
CEDARHURST, NEW YORK 11516

OFFICE OF THE MAYOR
NICHOLAS A. FARINA

TELEPHONE
295-5770

January 20, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Foster:

With respect to your statement concerning Civil Airplane Fleet Noise Requirements (E.I.S.), I as the Mayor of the Village of Cedarhurst and the Board of Trustees are in total agreement with your study, and wish to see this Civil Airplane Fleet Noise Requirement Regulation implemented immediately.

We commend you for your action and insight.

Very truly yours,

Nick

Nicholas A. Farina
Mayor of Cedarhurst

NAF/db

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
Raymond T. Schuler, Commissioner

1220 Washington Avenue, State Campus, Albany, New York 12226

January 15, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

Re: Draft Environmental Impact Statement
Civil Airplane Fleet Noise Requirements

Dear Mr. Foster:

We have reviewed the draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements and concur with the intent of the proposed Statement.

We cannot concur, however, with the proposed schedule of compliance. Prior to any schedule being established, it must be determined whether or not the manufacturer has the ability to supply sufficient retrofit kits within the allotted time frame. The retrofit schedule should be established based on the availability of material.

We cannot accept the Statement that there is a negligible increase in emissions from the retrofitted engines, until test results proving this fact are released. The Environmental Statement indicates emission tests are underway only on the JT3D and JT8D engines. Consideration must also be given to the Rolls Royce Spey and the early JT9D engines.

The BAC-1-11, currently in use by Allegheny Airlines, overflies a major portion of the northeast as a result of the Allegheny route structure. The high population density along these Allegheny routes make it extremely important that while noise is reduced, the emissions are not increased.

It is our understanding that a "hush kit" currently exists for the BAC-1-11. However, we have no information to indicate if this kit conforms to FAR Part 36 requirements. If the requirements are met, then consideration should be given to using the existing kit rather than a new retrofit package.

We strongly concur with the regulation of International Carriers. Since noise regulations are being imposed on United States carriers, it seems completely justified to apply the same controls to the competition. To do otherwise would defeat the purpose of the retrofit program.

Thank you for giving us an opportunity to review this draft Environmental Impact Statement.

Sincerely,

CLARENCE M. COOK, Supervisor
Airport Development Section

CMC/JR/CM

MEMPHIS-SHELBY COUNTY AIRPORT AUTHORITY

January 23, 1975

Council on Environmental Quality
722 Jackson Place, N. W.
Washington, D. C. 20006

Dear Sirs:

The Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements prepared by the Federal Aviation Administration, dated December 1974, has been reviewed.

We are in agreement with the conclusions reached in the impact statement. However, the retrofit compliance schedule provides a very slow time frame for relief to the airport communities which are affected. More expeditious relief is desirable, but if this is impractical, there is no strenuous objection to the draft proposal.

Another area of concern in the proposal is that foreign manufactured four engine aircraft will not be required to meet FAR 36 standards, only Annex 16 requirements. It seems inconsistent to require two and three engine foreign aircraft to be retrofitted, but not four engine foreign aircraft.

It is our desire to see final adoption of the proposed rule 74-14 as a major step toward solving the noise pollution problem around airports.

We appreciate the opportunity to comment on the Draft Environmental Impact Statement.

Sincerely,

W. M. Fletcher, Secretary
Memphis-Shelby County
Airport Authority

WMF/TMS/mr

cc: Mr. Chuck Foster
Mr. Don Reilly

VILLAGE OF LAWRENCE

NASSAU COUNTY, NEW YORK
WILLIAM D. DENSON
MAYOR

ACTING CLERK-TREASURER
PETER W. OVERS

196 CENTRAL AVENUE
LAWRENCE, NEW YORK 11559
516 - 239-4600

January 22, 1975

Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Foster:

The Village of Lawrence would like to go on record as being in complete accord with the findings of your Environmental Impact Study.

After examining this study, it becomes quite evident that it justifies the need to make a ruling on civil airplane fleet noise requirements (retrofit rules) effective immediately.

We urge you to bend every effort in creating early enforcement of such regulations to reduce the jet noise impact and hopefully bring some much needed relief to our community.

Very truly yours,

William D. Denson
Mayor

WDD;jc

The Commonwealth of Massachusetts
Aeronautics Commission
Boston - Logan Airport, Boston 02128

January 21, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
800 Constitution Avenue
Washington, D.C.

Dear Mr. Foster:

Thanks for the opportunity to comment on the draft EIS of the proposed SAM retrofit requirement. Overall, it's a thorough and intelligent treatment of the subject.

The Aviation Advisory Commission, in its January 1973 report, also supported the nacelle retrofit program and recommended immediate implementation. Page 74 of the AAC Summary Report has a concise statement of this position.

I was a bit surprised to notice that the alternative of more stringent standards didn't consider making the retrofit rule applicable to aircraft with gross weights under 75,000 lbs. While the total noise contribution of Lear jets, Sabreliners and the like may be relatively small, as individual events they can and do raise hell.

Your office is to be especially commended for the excellent treatment of the cost/effectiveness of the proposed rule and related noise abatement possibilities, even though you left out one of the best bets. While a two-segment approach is cost/effective (as your report shows) increasing existing glideslope angles to somewhere between $3\frac{1}{2}$ and 4 degrees is 727 times MORE cost/effective. See the attached for the details.

By the way, the two similar cost/effectiveness charts on pages 30 and C-32 don't quite agree. The option of "SAM-3D+2SEG+C/B" produces a 62% reduction in impacted area on p. 30 but only a 53% reduction on p. C-32. There are similar discrepancies in the "SAM 3D/8D+2SEG+C/B" and the "SAM 3D-RFN8D+2SEG" options.

Just as a matter of reader convenience, you might consider moving your excellent "capsule comparison" of SAM vs. Refan on p. 38 to a more prominent location. You might also like to more clearly emphasize the fact that the benefits of refanning the JT-8D remain theoretical while the SAM nacelle retrofit has been demonstrated.

Lastly, I thoroughly agree with your idea of figuring operational techniques into the overall noise abatement results, but I'm afraid you missed a few that at least deserve consideration. For instance, flap management (mentioned briefly) and increased takeoff deck angles have been shown to reduce noise significantly. Similarly, the possible diversion of some air traffic to less noise-sensitive fields deserves consideration and, while they're a last resort, curfews and quotas may be expected to have an effect on the noise abatement formulae.

I look forward to seeing the final version of the EIS on the nacelle retrofit program.

Yours,

Crocker Snow
Director of Aeronautics

RK/ep

January 24, 1975

Council on Environmental Quality
722 Jackson Place, N. W.
Washington, D. C. 20006

Gentlemen:

We have been in correspondence with the Airport Operators Council International concerning a draft of Environmental Impact Statement for special airplane fleet noise requirements, and we would like to be included in the record as being in complete support of the position urged by the Council.

The Council's position is set forth in fairly good detail in its letter of January 14, 1975 addressed to your office.

Very truly yours,

William T. Burns
Deputy Director of
Commerce for Aviation

WTB:g
cc: Chuck Foster, Director
Office of Environmental Quality

J. Donald Reilly, AOCI

CITY OF PHILADELPHIA
DEPARTMENT OF COMMERCE
DIVISION OF AVIATION
Philadelphia, Pa. 19153

PHILADELPHIA PA. 1975

ALIENS MUST REPORT THEIR ADDRESSES DURING JANUARY

Mr. Chuck Foster, Director
Office of Environmental Quality
Federal Aviation Administration
800 Independance Avenue, S.W.
Washington, D. C. 20591

THE PORT AUTHORITY OF NY & NJ

One World Trade Center
New York, N.Y. 10048

Aviation Department
Caesar B. Pattarini, Director
(212) 466-7453
(201) 622-6600 x7453

Morris Sloane, Deputy Director
(212) 466-7455
(201) 622-6600 x7455

January 27, 1975

Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20006

Gentlemen:

We have recently reviewed the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements prepared by the Federal Aviation Administration of the U.S. Department of Transportation dated December, 1974.

The Port Authority of New York and New Jersey is basically in agreement with the concept and content of the proposed Statement, subject to a few minor comments, as follows:

1. Compliance Date

   The proposed targets of 36 months for intermediate compliance and 48 months for full compliance (from the effective date of the regulation) seem reasonable. In view of past slippage, we feel that it is essential that the new regulation be issued at the earliest possible date with an early effective date in order that the public may receive the benefit of the retrofit treatment.

2. Refan Noise Reductions

   The discussion on Page 40 of noise reduction for Refan vs. SAM indicates that the DC-9 with refan will be "3 EPNdB quieter on approach". It is our understanding that FAA testimony before the House Subcommittee on Aeronautics and Space Technology showed a difference of 0.3 EPNdB, which in the absence of flight test data, is meaningless. It is suggested that the quoted language be deleted from the Draft Statement.

3. Benefits of Retrofit

   Section VIII on Page 47 should be expanded to emphasize some of the points made in the text and some of the points raised in the legislative history of the Noise Control Act.

In conclusion, we strongly recommend the earliest possible adoption of FAA's proposed Fleet Noise Level Rule in order that the public can receive the benefit of the significant noise reductions without further delay.

Sincerely,

C. B. Pattarini
Director of Aviation

CC: Mr. C. R. Foster, DOT

INCORPORATED

Village of Woodsburgh

NASSAU COUNTY, LONG ISLAND, N. Y.
30 PIERMONT AVENUE, HEWLETT, NEW YORK 11557
TELEPHONE: 295-1400

DONALD S. RUTH, MAYOR

January 16, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

I am familiar with the Environmental Impact Study recently issued by the FAA.

Our Village along with many others have suffered much from aircraft noise.

The implementation of retrofit rules should go far in giving our residents the relief they have long sought.

An early enforcement of such regulations would be most welcome and appreciated.

Sincerely,

ROBERT B. KULLMAN
Deputy Mayor
Inc. Village of Woodsburgh

RBK/dw

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

JOHN P. WOODFORD, DIRECTOR

AERONAUTICS COMMISSION
CAPITAL CITY AIRPORT
LANSING, MICHIGAN 48906
517-373-0576

January 22, 1975

Subject: Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements dated December, 1974
Review and Comment

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D.C. 20591

Gentlemen:

This is in response to your request for comments concerning the subject Draft Environmental Impact Statement.

We believe that the expected reduction in noise levels which would result from compliance with FAR Part 36 noise standards would represent a significant improvement to the environmental quality of land surrounding major airports. The small increases in fuel consumption and air pollution from aircraft emissions that would result from implementation of the proposed extension of Part 36 are worth the beneficial effects of this program.

We were unable to assess the cost benefit aspects mentioned in the statement due to time factors and staff limitations.

Very truly yours,

L. C. Andrews, Chief Engineer
MICHIGAN AERONAUTICS COMMISSION

gc

MICHIGAN
THE GREAT LAKE STATE

VILLAGE OF LAWRENCE

NASSAU COUNTY, NEW YORK
WILLIAM D. DENSON
MAYOR

ACTING CLERK-TREASURER
PETER W. OVERS
196 CENTRAL AVENUE
LAWRENCE, NEW YORK 11559
516 - 239-4600

January 27, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Mr. Foster:

Thank you for the opportunity of reviewing the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements. I was pleased to note that the statement contains strong and convincing arguments from every standpoint - environmental, technological and economic - for proceeding with the prompt issuance of a final rule.

I was, however, greatly disturbed to find that "the FAA is considering revising the intermediate compliance date to be 36 months from the effective date of the amended regulation with full compliance required 48 months from the effective date." As is noted, the time frame is certainly "different from that given in the NPRM (June 30, 1976 and June 30, 1978)." On two separate occasions I have written to the FAA on this issue, the last to Rule Docket AGC-24 on June 7, 1974. I said at that time "We wish also to express our concern that the compliance dates set forth in the NPRM, mid-1976 and mid-1978, may be extended in view of the time that has elasped since the proposal was first made. Any slippage in these dates is unacceptable to the communities which have already endured the noise problem too many years." The same sentiment was expressed earlier. These warnings have gone unheeded.

Now we find that these already too distant dates are to be pushed back further. The communities near Kennedy International Airport and the nation's other major airports must not be penalized because of the slow pace of the FAA's rule making. Certainly, a priority program could be initiated that would make the original dates feasible.

I urge you to retain the original dates in the final environmental impact statement and in the final rule, which we hope will be issued at

Mr. Foster - continued

January 27, 1975

the earliest possible moment. Such action must be taken in fairness to the Village of Lawrence and to other noise-impacted communities across the nation.

Very truly yours,

Herbert Warshavsky

Herbert Warshavsky
Trustee

HW;jc

Locust Grove Civic Association

OF QUEENS COUNTY, INC.
135-45 Lefferts Boulevard
So. Ozone Park, N. Y. 11420

Alfred Maggiore, President
114-10 - 150th Avenue
So. Ozone Park, N.Y. 11420

MICHAEL CAMPAIOLA
Vice-President
MAE D. COTTRELL
Secretary

February 6, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
800 Independence Avenue SW
Washington, D.C. 20591

Dear Sir:

We recommend that the Retrofit Program, as proposed in the Environmental Impact Statement, to lower noise levels, be put into effect immediately.

Residents in our area and those in areas surrounding Kennedy Airport are in favor of anything that will help reduce noise, and hope that some relief can be obtained through this program.

Sincerely,

Alfred Maggiore
President

AM-mdc

LOCUST GROVE CIVIC ASSOCIATION

Alfred Maggiore, President
114-10 - 150th Avenue
So. Ozone Park, N.Y. 11420

VALLEY STREAM, N.Y.
FEB 7
1975
11580

Mr. Charles R. Foster
Director of Environmental Qualit
Federal Aviation Administration
800 Independence Avenue SW
Washington, D.C. 20591

METROPOLITAN DADE COUNTY · FLORIDA

P. O. BOX 592075 AMF
MIAMI, FLORIDA 33159

TEL: 526-2000

AVIATION DEPARTMENT

January 29, 1975

Council on Environmental Quality
722 Jackson Place, N. W.
Washington, D. C. 20006

Gentlemen:

Miami International Airport is situated so as to be adjacent to or near a number of residential areas some of which contain significant population density. Consequently, the citizens of our area and numerous agencies of city, county, state, and federal government are all very sensitive to any action which will have an effect on noise pollution in our community.

The Environmental Impact Statement for Civil Airplane Fleet Noise Requirements prepared by the Federal Aviation Administration dated December, 1974, reaches a number of conclusions in which the Dade County Aviation Department is in agreement.

In particular, we strongly favor requiring <u>all</u> foreign manufactured aircraft to meet FAR 36 standards without exclusion, which would include four engine aircraft as well as two and three engine aircraft. Any compromise from this position would cause the Dade County Aviation Department to totally withdraw our approval from NPRM 74-14.

Last year thirty-four percent of the passengers traveling to and from our airport had origins or destinations outside the continental U. S. limits. Sixty-six percent of the freight and express processed through MIA also originated or was destined to points outside the continental U. S. Experience shows that both foreign passengers and freight are increasing as a percent of the total traffic processed at MIA.

Consequently, foreign aircraft are having an increasing influence on the noise profile which affect our community. We feel that it is imperative that these aircraft adhere to the noise abatement procedures embodied in FAR 36 as originally proposed.

Your consideration of our position on these matters is appreciated.

Very truly yours,

I. H. Carr

I. H. Carr
Planning Section Head

IHC:mcp

cc: Mr. Chuck Foster, Director
Office of Environmental Quality
Federal Aviation Administration
800 Independence Ave., S. W.
Washington, D. C. 20591

INCORPORATED
VILLAGE OF GARDEN CITY
NASSAU COUNTY, N. Y.
351 STEWART AVENUE
GARDEN CITY, L. I., N. Y. 11530

TEL. PIONEER 2-5800
FIELDSTONE 7-5800

INCORPORATED VILLAGE OF GARDEN CITY SEAL

February 10, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Foster:

The Garden City Board of Trustees and I have studied the draft Environmental Impact Statement for "Civil Airplane Fleet Noise Requirements" and wish to express to you our support of this statement.

We likewise wish to register with you our support of the proposed rule to change the size and location of aircraft registration markings to require aircraft to have an identifying number on the underside of the wing.

Thank you for your consideration.

Very truly yours,

Raymond L. Regan

Raymond L. Regan
Mayor

RLR:rr

PRIVATE CITIZENS

William D. Daugherty
8336 Chase Avenue
Los Angeles, Calif. 90045

January 15, 1975

Department of Transportation
Federal Aviation Administration
Washington, D. C., 20591

Reference: Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements

Gentlemen:

As a resident near Los Angeles International Airport I urge you to approve the Sound Absorbing Material (SAM) Program to quiet the jet aircraft which do not meet Part 36 of the Federal Air Regulation.

This and future aircraft noise attenuation techniques are essential to restoration of property values and the physical and mental well-being of residents in such noise impacted areas. Because of the present high noise levels in and around airport installations a considerable amount of property has been condemned and removed from the tax rolls. With every reduction of consequence in dB level, parcels could be recovered and put into private and productive use.

Sincerely yours,

William D. Daugherty

WDD:db

TO: Department of Transportation, Federal Aviation Administration

RE: "Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements"

Gentlemen,

I am in favour of approval of Sound Absorbing Material (SAM) Program to quiet the present noisy fleet of jets which do not meet Part 36 of the Federal Air Regulation.

We are living in the area of Los Angeles International Airport where two hundred thousand people are subjected to excessive noise levels. The Airport expansion forced condemnation of 3000 homes and 2 major schools and displacement of over 10,000 people.

Many communities around the country suffer from similar problems: loss of revenue, lower property value, deterioration of educational standards due to noise interruptions, loss of sleep and hearing, nervous disorders, property condemnation, big costs of litigation.

100,000 people on the ground should deserve the same consideration as 100 people in a noisy plane. Some reasonable compromise between conflicting rights of people should be reached.

SAM program would substantially reduce the intolerable noise levels and preserve many residential communities from further deterioration of which we cannot afford.

The costs of implementation could be recovered by curtailing the unnecessary flights. Many planes take off with only 50% of passengers or less aboard. Some coordination between Airlines and streamlining of wasteful procedures could save money to help SAM Program.

A speedy approval is urged.

Sincerely A. Stefanski

ANDREW F. STEFANSKI
7296 W. 85th St.
Los Angeles, Cal. 90045

1-14-75

C. A. N. citizens against noise

2729 W. Lunt Ave. • Chicago, Illinois 60645 • (312) 274-0980

23 January 1975

Dear Mr. Foster

We are responding to your Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements. We find serious shortcomings in three areas, which we hereby detail.

1. We find mention but no intent to regulate land use around airports. While we agree that retrofitting and other mechanical restrictions on aircraft are essential to the control of airport noise, regulations must also take into consideration the areas on which noise impacts. Since the local governments have abdicated this responsibility of restricting residences to reasonable distances from the areas of airports, it falls upon the Federal Government to do so. We would suggest that the immediate ring around airports be restricted to heavy and noisy industries, and that at increasing distances from airports, lighter manufacturing be allowed, then office buildings and residences, farthest away.

2. We can find in these documents no mention of supersonic transports or the control of noise from aircraft at supersonic speeds. We feel this is a serious omission which needs correction.

3. We wonder why these regulations are restricted to civil fleets. While commercial jetliners create the most noise in the broader area of airports, general aviation is responsible for much noise closer to airports. Furthermore, there is no military advantage to noise--nay, some real tactical advantages to quiet. In addition, civilian areas around military airfields are impacted more heavily in some cases by aircraft noise than are like areas around civilian airports. We therefore request that these or similar regulations apply equally to noise from military aircraft.

Sincerely,

T. Berland

THEODORE BERLAND, President

Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

TB:hj

CC: Dr. Alvin Meyers, ONAC, EPA, Sen. Stevenson, Sen. Percy, Cong. Yates

COMMUNITY PLANS, INC. *Westchester - Playa del Rey*
Post Office Box 90632 - Los Angeles, California 90009 - Telephone (213) 823-2628

Office of the Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

Ref: Draft Environmental Impact Statement for
Civil Airplane Fleet Noise Requirements

Gentlemen:

Community Plans Incorporated urges adoption of the "Sound Absorbing Material" (SAM) retrofit program to bring the noise levels of all "narrow body" commercial aircraft within the standards of FAR Part 36 as soon as possible. Our preference for the SAM retrofit program over the "Refan" proposals for near-term improvements in the acoustic environment around airports throughout the nation are based on the following facts.

1. SAM retrofit will provide earlier relief than Refan.

2. SAM would apply the noisiest aircraft, e.g., 707s, and DC-8s, as well as 727s, 737s, and DC-9s, whereas the refan program would apply only to the latter group.

3. SAM would be less costly than Refan.

Our preference for the SAM program should not be construed as implying opposition to the Refan proposal per se. We believe airport neighbors should be able to enjoy some relief from aircraft noise as soon as possible; and we believe as many aircraft as possible should be included in any retrofit program.

CPI would also enthusiastically support a more comprehensive two phase program of retrofitting all aircraft with SAM now, and followed by a second phase later to include refanning those aircraft which could benefit from additional noise reduction.

If, contrary to our recommendation, you should choose the Refan program for 727s, 737s and DC-9s, we would strongly urge that the SAM program be made mandatory for 707s, DC-8s and other aircraft not covered by the Refan program.

We further believe that any noise reduction rule adopted should apply equally to foreign and domestic airlines operating in the United States.

Community Plans, Inc. *Westchester - Playa del Rey*
Post Office Box 90632 - Los Angeles, California 90009 - Telephone (213) 823-2628

Community Plans Incorporated is a citizen planning organization made-up of residents and business people in the Westchester-Playa del Rey area adjacent to the north side of Los Angeles International Airport. Over the past eight years we have repeatedly supported measures aimed at reducing noise impact on airport neighbors; eg quiet engine/nacelle retrofit, compatible land use, federal noise standards, preferential run-way useage, two-segment approach, and California state noise standards in the absence federal noise standards.

We trust you will give our views due consideration in reaching a decision which will bring some measure of relief, as soon as possible, to the multitude of people who have suffered for years from excessive air-craft noise.

Very truly yours,

Normand E. Morgan

Normand E. Morgan, President
Community Plans Inc.

Indianapolis Airport Authority • Weir Cook Municipal Airport

EXECUTIVE DIRECTOR • DANIEL C. C=CUTT
INDIANAPOLIS, INDIANA 46241 • (317 ...)

January 24, 1975

Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20006

Re: Draft EIS for Civil Airplane Fleet Noise Requirements
Prepared by F.A.A./D.O.T December 1974

Gentlemen:

The Indianapolis Airport Authority operates a medium-hub air carrier airport serving the metropolitan Indianapolis area. The Authority, in developing its Airport Master Plan, has examined the noise impact area around Weir Cook Airport. Because the airport is only 6½ miles from the center of the city, its noise footprint encompasses a major portion of the metropolitan area.

Because of the significance of noise impact on our community, the Airport Authority has been very active in its support of reduction of noise at its source. We have examined and evaluated sound absorption material programs vs. refan programs. We've waited patiently for more than ten years for effective noise relief. Because of three close-in residential areas, which are subjected to continual aircraft noise from airplanes on their approach to Weir Cook Airport, we have been subject to a great deal of criticism and complaint from the general public.

In examining our alternatives of the Airport Master Plan, it was determined that the airport could remain in its present location only if there was significant relief from aircraft noise at its source, and a corresponding land acquisition program with vicinity land-use planning and zoning to complement an aircraft noise reduction program. In order to be effective, the aircraft noise reduction program must meet FAR Part 36 immediately, with future reductions by 1980.

The Airport Authority has responded to the ANPRM (Civil Airplane Fleet Noise Level), participated in the EPA study analysis impact of aircraft/airport noise, and reviewed more than twenty documents and reports issued by EPA and Congress on this problem.

We are convinced and support 100 per cent the SAM program. We

--Cont. on page 2--

are disappointed in two points now contained in the EIS that were not contained in the original NPRM. One, is the compliance schedule; and the second, to omit foreign-manufactured, 4-engine aircraft. Although at the present time we do not have any foreign 4-engine aircraft operating from our airport on a regularly scheduled basis, we do have an occasional charter aircraft which would be exempt under the NPRM considered by the EIS. Since we had commented on the original NPRM and this feature was not included, we do not feel that an EIS is an appropriate place to make a change and the agency should be required to publish a proposed change.

The second change from the original proposal is of a much greater concern. We have already waited more than ten years for a meaningful noise relief. The citizens around our airport and airports across the country are entitled to responsive Federal action with a firm date. F.A.A.'s proposal to now change the dates from June 30, 1976, for retrofit on one-half the fleet, and June 30, 178, for retrofit on the balance, is unacceptable. The previous published dates should stand.

Subject to these two comments, we urge the immediate approval of the EIS and implementation of the sound absorption material program.

Sincerely,

Daniel C. Orcutt
Executive Director

DCO/ca

cc: Mr. Chuck Foster
Director
Office of Environmental Quality
FAA - 800 Independence Ave.,S.W.
Wash. D. C. 20591

METROPOLITAN NASHVILLE AIRPORT AUTHORITY

METROPOLITAN AIRPORT P. O. BOX 17208 NASHVILLE, TENNESSEE 37217

ALBERT J. HUBER, A.A.E.
EXECUTIVE DIRECTOR

TELEPHONE (615) 259-3801

January 28, 1975

Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D. C. 20006

Gentlemen:

I am in receipt of a January 14, 1975 letter written to you by J. Donald Reilly, Executive Vice President of Airport Operators Council International, expressing AOCI's position as favoring the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements (SAM).

The Metropolitan Nashville Airport Authority is a member of the AOCI, and I wish to state our support of subject Environmental Impact Statement. We did go on record by letter of June 17, 1974 (attached) favoring the Sound Absorbing Material (SAM) method as an effective means of reducing aircraft noise levels. From an airport operating standpoint, expeditious rule making enforcement procedures will be very helpful in presenting plans and programs for expansion and development of airport facilities. Issuance of a final Environmental Impact Statement on SAM will fulfill FAA responsibilities under the National Environmental Policy Act of 1969.

While AOCI in representing its member airports has already provided you with an Association position, we wish to go on record as supporting the drafted Environmental Impact Statement.

Yours very truly,

Albert J. Huber, A.A.E.
Executive Director

AJH:KM

cc: Mr. Chuck Foster
Office of Environmental Quality - FAA

Mr. J. Donald Reilly
Executive Vice President - AOCI

Mr. Herbert Banks, Airport Manager, Chattanooga, Tennessee
Mr. William K. Hart, Airport Manager, Johnson City, Tennessee
Mr. Robert H. Wood, President, Memphis-Shelby County Airport Authority, Memphis, Tennessee
Mr. Henry A. Willis, Director of Aviation, Knoxville, Tennessee

METROPOLITAN NASHVILLE AIRPORT AUTHORITY

METROPOLITAN AIRPORT P. O. BOX 17208 NASHVILLE, TENNESSEE 37217

COMMISSIONERS

HAROLD J. BLACK, P.E., CHAIRMAN
JAMES L. HARPER, VICE CHAIRMAN
FRANKLIN JARMAN
WHITNEY STEGALL
JOHN C. TUNE
C. D. WALLING, JR.
DAVID K. WILSON

ALBERT J. HUBER, A.A.E.
EXECUTIVE DIRECTOR

TELEPHONE (615) 259-3801

June 17, 1974

The Honorable Howard H. Baker, Jr.
United States Senator
2107 New Senate Office Building
Washington, D. C. 20515

Dear Senator Baker:

We have received a copy of Mr. Reilly's June 7, 1974 letter to you outlining reasons the Airport Operators Council International is strongly urging that the Federal Aviation Administration issue its proposed regulations covering aircraft noise abatement. As indicated in Mr. Reilly's letter, the Metropolitan Nashville Airport Authority is a member of AOCI and supports the Council's position with respect to this long standing item of business.

We are of the opinion that if industry and government do not earnestly and sincerely address themselves to the business at hand, community reaction to unregulated aircraft noise will continue to cause opposition to further development of the nation's system of airports. Economics and technology set out in the packet of material attached to Mr. Reilly's letter clearly indicates that a reasonable objective type "retrofit" aircraft noise abatement program can be mutually supported at this time by both industry and government. Speaking as an airport operator, we are continually aware of what can happen on the local scene with respect to receiving community support for continued airport expansion and development programs. Presently the Metropolitan Nashville Airport Authority is in the process of developing plans and construction programs covering building a reliever airport in the western sector of Davidson County. One of the first things residents in the proposed construction area expressed was concern with aircraft noise. The Airport Authority presently operates three other airports, and understandably so, noise emission is always a point of concern and contention any time public hearings are held.

While appropriate regulating agencies of government have been moving ahead with review of their respective activities in this area, we are at a point where something concrete can be done now to comply with original intent of Public Law 90-411, passed by Congress in 1968. Proven application of sound absorption material (SAM) as an interim measure for full retrofit and introduction of the "two-segment" approach procedure for keeping aircraft noise away from populated areas as fully discussed in Mr. Reilly's letter offer an acceptable solution to providing a meaningful aircraft noise abatement program.

We would like to take this opportunity to endorse AOCI's stated aircraft noise abatement position, joining other concerned airports in urging your favorable consideration for implementation of a meaningful program, encouraging the Federal Aviation Administration to issue its proposed rule making covering one of civil aviation's most pressing problems.

Sincerely,

Albert J. Huber, A.A.E.
Executive Director

AJH/h

cc: Mr. J. Don Reilly, AOCI
Mr. Herbert Banks, Chattanooga Airport
Mr. Norman Helinski, Director of Public Service, Knoxville
Mr. Robert H. Wood, Memphis Airport
Mr. William K. Hart, Tri-City Airport

PORTS AUTHORITY
COMMONWEALTH OF PUERTO RICO
G.P.O. BOX 2829, SAN JUAN, PUERTO RICO 00936

JULIO MAYMI PAGAN
Executive Director

January 23, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D. C. 20591

Dear Mr. Foster:

In response to your letter of December 9, 1974, below please note our comments on the Draft Environmental Impact Statement for Civil Airplane Flight Noise Requirements.

The Puerto Rico Ports Authority, as operator of the public airports of the Commonwealth of Puerto Rico, has a vested interest in the pursuit of positive and meaningful action that will result in the amelioration of aircraft noise. We are not different from many mainland U. S. airports where serious environmental noise problems exist. In particular, the urban areas of Puerto Rico are subjected to high-noise levels resulting from many sources including the noise associated with aircraft landing or departing from the many airports within the Commonwealth. Therefore, the Ports Authority believes that it must address to some of the topics discussed within this Draft Environmental Impact Statement.

The noise certification standards and procedures established under FAR Part 36 were indeed welcome to the airport operators as they indicated that quieter aircraft would be available in the very near future. In Puerto Rico, we have seen the direct results of these regulations at the Puerto Rico International Airport, located east of San Juan. In the last four years this airport has seen a dramatic change in equipment, from the noisier B-707 and DC-8 series aircraft to the more quiet B-747, L-1011, and DC-10 aircraft. This is primarily because San Juan is a long-haul, high-density market, and the carriers could operate more efficiently and profitably by using the wide-bodied aircraft in this market.

The Puerto Rico International Airport is by no means free from the noise attributed to the older series aircraft. We have numerous foreign and domestic supplemental air carriers operating from the airport which utilize the older, noisier U. S.-manufactured equipment. Therefore, the Puerto Rico Ports Authority is vitally interested in any program that will substantially effect the replacement or modification of these older aircraft.

The Ports Authority encourages and agrees to any proposed action that will provide meaningful relief to the general public. The action outlined in subject Environmental Impact Statement will definitely reduce the noise impact associated with aircraft operations and is, therefore, of importance to the Authority.

Since the International Airport is served by many foreign carriers, with U. S.-manufactured equipment, the Ports Authority believes that the provisions outlined for foreign or overseas commerce are appropriate. Some of the foreign operators are already utilizing wide-bodied aircraft on their high-density, long-haul routes, and the provisions of the Environmental Impact Statement would insure that they continue to operate this equipment.

The Draft Environmental Impact Statement states that financial aspects of the retrofit program should not be considered a subject for comment. However, when weighing the cost/benefits of the retrofit program, we must consider financing. The Federal Aviation Administration must give consideration to financing methods which will insure that the air carriers will not further increase the passenger fares in order to recover their retrofit costs.

The noise benefits derived from the proposed action will provide meaningful relief by significantly reducing annoyance levels in the vicinity of airports. However, the potential penalty of increased fuel consumption must be closely scrutinized. The Draft Environmental Impact Statement in its present form, considers the increased fuel consumption as a negligible result far worth the benefits derived from the proposed action. This is evident in the statement that "retrofit would change total energy use by no more than 0.013%". (Page 23 of the drafted document). However, in the same paragraph it indicates that the air carrier fuel use would be increased by 4,000 barrels per day, or on an annual basis, 1,460,000 barrels of additional fuel consumed. We believe that this increased consumption of aviation fuel cannot be dismissed lightly. The increased demand for aviation fuel, coupled with the dwindling world supply of petroleum products, clearly calls for positive action to retain our natural resources where possible. Therefore, the Ports Authority urges the Federal Aviation Administration, in preparing its final Environmental Impact Statement, to more thoroughly consider the total impact of this additional fuel consumption versus the noise benefits derived from the proposed action.

In summary, the Ports Authority endorses and agrees to the retrofit program. But at this moment our main concern is the matter of getting some assurances that any of the costs of the retrofit program be not passed on to the air traveller. In addition, the Federal Aviation Administration should give thorough consideration to the matter of changes in fuel consumption versus the benefit derived from the proposed rule.

Finally, we concur with the AOCI's position in that the retrofit compliance schedule set forth in the draft outlines timing which may prove to be very slow in providing relief to the affected communities. We favor expeditious relief.

Many thanks for the opportunity to express our views on this important matter.

Sincerely,

Julio Maymí Pagán
Executive Director

AIRPORT AUTHORITY
BOX 80407, LINCOLN, NEBRASKA 68501

Mr. Chuck Foster, Director
Office of Environmental Quality
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

LINCOLN

...a short distance from anywhere

January 23, 1975

Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20006

Dear Sir:

We would like to go on record as fully agreeing with the letter submitted by the Airport Operators Council International on January 14, 1975 in reference to the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements prepared by the Federal Aviation Administration dated December, 1974.

Airport noise is a major problem which we feel must be tackled at the source as soon as possible. Since the EIS is the next step in the process, we recommend its approval so the Proposed Rule can become established law and the problem of noise can be met head on.

Sincerely,

AIRPORT AUTHORITY

Joseph H. Hills
Administrative Assistant

JHH:pw

cc: Chuck Foster, Director
Office of Environmental Quality

City of Los Angeles
Department of Airports
Tom Bradley, Mayor

1 World Way
Los Angeles, California 90009
213/646•5252 Telex 65•3413

Los Angeles
Ontario
Van Nuys
Palmdale

January 6, 1975

Ref: Docket No. 13582; Notice No. 74-14
Civil Aircraft Fleet Noise Requirements

Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements

Federal Aviation Administration
Office of the Chief Counsel
Rules Docket, AGC-24
800 Independence Avenue, S.W.
Washington, D.C. 20591

Dear Sir:

The City of Los Angeles, Department of Airports has carefully reviewed the referenced Draft Environmental Impact Statement. This draft was submitted in support of Docket No. 13582. The following comments are intended to supplement our letter of April 5, 1974 concerning this docket.

In studying this EIS, we note in Item 5 of the summary sheet that comments have been requested from various entities. We are very concerned in looking at this list that there is not one airport or airport association listed. It is obvious that the airports and their neighboring communities have long received the major brunt of the aviation noise problem. As a consequence, items such as this EIS associated with noise reduction regulations are of great interest to the airports. For the good of the air transportation industry and the interest of the airports that act as the ground base of their operations, the airports must become involved.

In general after studying the EIS, we agree that the sound absorbant material (SAM) retrofit program, coupled with all safe sound abatement flight procedures, is a proper approach to the noise problem. The airports cannot wait for the refan program, nor can they exist without severe operational restrictions if nothing is done. The SAM program, with flight procedures, will provide noise relief within a proper time frame with the greatest cost benefit.

On Page 23 of the EIS, we note the statement that it might be possible for sound abatement flight routings to be eliminated with retrofit. The reverse traffic "over-water procedures" at LAX is cited as an example. It must be pointed out here that aircraft operating to Part 36 levels are still noisy. This category, by any impact methodology, will still require large compatible land use zones under the airport flight paths. As a result, sound abatement routings will still be required to reduce the noise impact to its lowest denominator.

In considering the timing of retrofit presented in the EIS, we would completely support the change from that shown in NPRM 74-14. The EIS proposed scheduling of 50 percent compliance in 36 months, with 100 percent compliance in 48 months from the date of the regulation, appears reasonable. The entire project should go forward with the utmost speed.

We appreciate the opportunity to comment on this EIS.

Very truly,

Clifton A. Moore
General Manager

CAM:BJL:jb

cc: Don Reilly, AOCI
Russ Hoyt, AAAE

METRO SUBURBAN AIRCRAFT NOISE ASSOCIATION INC.

P. O. BOX 88
Inwood, L. I., N. Y. 11696

January 22, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
800 Independence Avenue SW
Washington, DC 20591

RE: Environmental Impact Statement
Civil Airplane Fleet Noise Requirements

Dear Sir:

The recent Environmental Impact Statement on retrofit indicates the need for such a program to lower the noise residents around airports are subjected to.

We recommend the retrofit program be put into effect immediately.

Yours for quieter skies,

Joseph R. Lewis
President, METRO

January 24, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Washington, D. C. 20591

Reference: Comments on the "Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements" dated December 1974

Dear Mr. Foster:

A very high priority should be assigned to the implementation of the Federal Aviation Administration program to reduce jet aircraft noise in the communities which surround airports. The airport area have subsidized the airline industry far too long by putting up with the excessive and unnecessary noise generated by the low flying aircraft. It is time for the airline industry to start acting the part of a good neighbor, if not voluntarily then involuntarily.

On page 5 of the draft it is noted that "a safe and practicable application of acoustic technology has been developed and tested that would allow aircraft certification prior to the effective date of FAR Part 36 to be modified to meet the noise level certification standards while maintaining compliance with appropriate airworthiness safety standards."

On page 14 the National Research Council of the National Academy of Sciences and the National Academy of Engineering is quoted. "We believe that the above reductions in aircraft noise level represent significant and beneficial improvements, which will provide meaningful and perceivable relief to airport neighbors. Recent research had indicated clearly that aircraft noise reductions on the order of 6 EPNdB are quite apparent to residents near airports and result in substantially less annoyance to those residents."

The Supreme Court, this past week, has put the airport operators on notice that it is going to be very expensive for them to operate the airports in a noisy manner. The court has let stand a $650,000 damage claim against the Los Angeles International Airport. It appears this is only the beginning of law suits against irresponsible airport operators.

All technical, safety and economic barriers have been overcome towards making the commercial jet aircraft using U.S. airports to comply with at least FAR Part 36 noise levels. It is the FAA's responsibility to eliminate any further delay and institute an accelerated SAM retrofit program to provide relief to the airport area residents.

C. R. Foster, FAA
Jan. 24, 1975

The airline industry has demonstrated their lack of concern by failing to voluntarily install SAM retrofit kits to quiet their existing jet aircraft. The airport operators now face costly court suits and damage claims because of inadequate planning and of excessive noise around airports. The alternative open the the airport operators is to acquire the noise impacted land. Both options are far more costly than the cost of the SAM program.

The FAA should adopt an effective noise abatement program by:

1) A SAM retrofit of all jet aircraft, both foreign and domestic which use U.S. airports, which currently do not meet FAR Part 36 noise levels.
   a) One-half of all the aircraft by Jan. 1, 1977.
   b) All aircraft by July 1, 1978.

2) All aircraft which have been SAM retrofited will be exempt from any refan (high by-pass ratio engine) retrofit program.

3) All newly manufactured current model aircraft will use high by-pass ratio type engines.

4) Eliminate all noise trade-offs such as those described on page 10 of the draft.

5) Establish an absolute fleet noise level rating and institute a non-degradation standard.

6) Immediately institute operational procedures which willgive releif now and even more so with SAM engines.
   a) Power cut-back on takeoff as proposed by the Air Line Pilots Association.
   b) Flap management technique on approach.
   c) Two-segment approach fully implemented by Jan. 1, 1978.

7) Set up an Aircraft Noise Abatement Trust Fund to pay for the SAM retrofit program and the adoption of the two-segment approach. The Fund should be funded by:
   a) $0.50 to $1.00 surtax on all tickets.
   b) One per cent surcharge on all freight way bills.

   The charges should be clearly identified as to their purpose just as the security surcharge is identified.

8) On Jan. 1, 1980, the FAR Part 36 noise levels for all newly manufactured aircraft should be reduced by 15 EPNdB.

9) Supersonic transport (SST) aircraft will no longer be exempt from FAR Part 36 noise levels.

Sincerely yours,

Henry J. Grimme

Henry J. Grimme, Secretary
O'Hare Area N.O.I.S.E. Chapter
National Organization to Insure a
Sound-Controlled Environment
7735 West Norwood Street
Chicago, Illinois, 60631

SALT LAKE CITY INTERNATIONAL AIRPORT
[illegible]
SALT LAKE CITY, UTAH 84122
MURRAY A. BYWATER, MANAGER

January 23, 1975

Council on Environmental Quality
722 Jackson Place, N. W.
Washington, D. C. 20006

Gentlemen:

Salt Lake City International Airport is in favor of the final adoption of Notice of Proposed Rule Making 74-14.

We feel that retrofit of all aircraft under FAR 36 be completed on the original time schedule and that all foreign aircraft meet the same requirements as domestic aircraft.

While Salt Lake City has been fortunate with regard to noise due to its location, there are many airports and their surrounding communities which need relief immediately or in the near future.

If we can be of additional assistance in this important matter, kindly let us know.

Cordially,
Original Signed by
MURRAY A. BYWATER

MURRAY A. BYWATER, A.A.E.
Airport Manager

GHB/fr

CC: Mr. Chuck Foster, Director ✓
Office of Environmental Quality
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D. C. 20591

Salt Lake City International Airport
AMF Box 22084
Salt Lake City, Utah 84122
Murray A. Bywater, Manager

POSTAL SERVICE
PM
24 JAN

Mr. Chuck Foster, Director
Office of Environmental Quality
Federal Aviation Administration
800 Independence Avenue, S. W.
Washington, D. C. 20591

AECMA

ASSOCIATION EUROPEENNE DES CONSTRUCTEURS DE MATERIEL AEROSPATIAL

68 Bd Malesherbes 75008 PARIS
Téléphone 292 25 50
Télégr.: ASINCOMA PARIS Ext 037
Télex: SYSTELE PARIS 21550 Ext 31

JH/GEP. 21st January, 1975.

Mr.Charles R.Foster,
Director of Environmental Quality,
Department of Transportation,
Federal Aviation Administration,
Washington DC 20591.
U.S.A.

Dear Mr.Foster,

AECMA Comments on Environmental Impact Statement
for Civil Airplane Fleet Noise Requirements

AECMA, representing European aircraft and engine constructors has examined FAA Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements and welcomes the opportunity to submit the following comments.

AECMA is totally opposed to the rule being applied to foreign operators and considers that such requirements affecting International commerce must be agreed on an International basis such as would be provided through ICAO. The number of movements by foreign operators at the very small number of United States airports apart from New York (JFK) and possibly Miami given in the draft Environmental Statement is small compared with the total number of movements at these airports. It is expected that even at those airports taking the majority of foreign operated aircraft a higher proportion will be of the newer technology type and aircraft already certified on the US register with lower noise levels.

Furthermore we don't consider that the operation of foreign manufactured and registered aircraft should be subject todifferent regulations depending on number of engines nor that aircraft which may be designed to meet the internationally agreed environmental requirements of ICAO should then be subjected to more severe requirements when operated into the United States.

The removal of the trade-off allowance for retrofitted aircraft is considered to be thoroughly anomalous in that it applies a more stringent requirement for the older type of aircraft than is currently applicable for new aircraft.

Continued.

Further production of older types are now required to meet FAR Part 36 levels with trade-offs and will as soon as they enter service with airline fleets be required to meet the proposed Fleet Noise Rule which stipulates FAR Part 36 levels with no trade-offs. The issue of the Fleet Noise Requirement as it now stands will therefore lead to conflicting legislation.

As stated in the AECMA response to the NPRM No. 74-14, the noise levels of the older engines may not be well matched to the prescribed levels at the three measuring points. Engines in service to-day fall into two categories of low bypass jet engines and turbofans which present very different problems in achieving the specified noise levels. This leads us to believe it may be economically practical to ensure compliance with the noise levels with some margin at two or the three measuring points but the noise level at the third point may be difficult to achieve. It is imperative therefore, that the impact of this should be eased by retaining the trade-off margins for the retrofitted aircraft and there is a strong case for increasing the margins to a total exceedance of 4 EPNdB with any single point not exceeding 3 EPNdB. This suggested modification of the trade-off margins for retrofitted aircraft would also provide a noise trade-off standard consistent with that developed by ICAO in Annex 16 for new aircraft.

Yours faithfully,

J.A.Hay
Chairman AECMA Noise Group

From: Mr.J.A.Hay, British Aircraft Corporation Ltd, Brooklands Road, Weybridge, Surrey KT13 ORN. England.

Airport Cities Action Committee

[illegible]
GREATER WESTCHESTER HOMEOWNERS ASSOCIATION
CITY OF INGLEWOOD
PLAYA DEL REY CIVIC UNION
PLAYA DEL REY WOMEN'S CLUB
COMMUNITY PLANS INC.
PALISADES DEL REY PROPERTY OWNERS ASSOCIATION
THE WATCHFUL EYE
NORTH RUNWAY RESIDENTS

8129 Calabar Avenue
Playa del Rey, CA 90291
January 14, 1975

Office of the Department of Transportation
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Subject: Draft Environmental Impact Statement, Pursuant to Section 102(2) (C), P.L. 91-190

Dear Sir:

We strongly support the use of Sound Absorbing Material as a means to reduce the noise emitted by air carrier fleets which do not now meet Federal Aviation Regulation Part 36, and we urge approval of the SAM program by the FAA at the earliest possible date.

Three areas of concern to us, however, are:

1) Page 7, Draft Environmental Impact Statement - "At this time, the FAA is considering revising the intermediate compliance date to be 36 months from the effective date of the amended regulation with full compliance required 48 months from the effective date. This time frame is different from that given in the NPRM (June 30, 1976 and June 30, 1978)."

   The technology is available; a further extension of time is unnecessary. It's taken our government 17 years to recognize the fact that a severe noise problem exists. The public should not have to continue suffering for the convenience of airlines. In this case, the benefit to the public should be the deciding priority.

2) Page 15, Table II-1, Draft EIS - the testing and certification estimates for takeoff noise reduction (including retrofit) were obtained with a cutback in engine power.

   We believe this should be a built-in regulation within the Civil Airplane Fleet Noise Requirements, so that engine cutback will be used at all times except in situations when safety precludes such use.

3) Page 35, Draft EIS - "Another subset of this alternative is the exemption of all or part of the carriers engaged in international operations (foreign and overseas air commerce), an exemption considered in the ANPRM."

   The abating of noise inflicted on airport neighbors is the basis for the SAM Retrofit Program. With this purpose in mind, we feel the exclusion of any specific

Office of the Department of Transportation
Federal Aviation Administration

Draft Environmental Impact Statement

air carriers will certainly not be in the best interests of the public. Noisy aircraft also damage people and property in other parts of the world.

In conclusion, we believe the SAM Retrofit Program is a beneficial one, and that it should get underway as quickly as possible.

There is, however, an urgency about tightening up the regulations for the protection of the public. Aircraft noise is damaging; the reaction of people to it has caused unending problems to the operation and growth of airports. Therefore, no further delays should be allowed the airlines in meeting the compliance schedule. Reduced takeoff noise, gained by engine cutback along with retrofit, should be a requirement stipulated in the Noise Regulations, except when the cutback is considered to be unsafe. International carriers make noise too; their exclusion seems to defeat the whole purpose of the retrofit program.

Seventeen years is a long time to wait for an "improvement". But it is a big step in the right direction, and worthwhile as long as it remains undiluted by needless delays and exclusions.

Yours truly,

(Mrs.) Sallie Davison, Chairman
Airport Cities Action Committee

SD:me

CITIZENS FOR A QUIETER CITY, INC.
Box 7777, Ansonia Station, New York, N.Y., 10023 ~~(212) 362-4942~~

Robert Alex Baron, Executive Vice President

February 7, 1975

Mr. Charles R. Foster
Director of Environmental Quality
Department of Transportation
Federal Aviation Administration
Washington, D.C. 20591

Dear Mr. Foster:

CQC cannot undertake at this time to analyze the technical aspects of the Draft Environmental Impact Statement for a proposed Federal Aviation Regulation which would establish standards for all turbojet aircraft with takeoff gross weight of 75,000 poiunds or greater.

However, CQC does recognize that the proposed regulation is a progressive step to ameliorate the airport noise problem. In one sense the environment is better protected noise-wise if noise abatement features are built into the plane itself with secondary reliance on flight procedures.

It is heartening to see the FAA's apparent new attitude towards aircraft noise as exemplified by this proposed regulation. If we have any quarrel with the regulation, it would be, understandably primarily with questions of degree of a atement and expansion of coverage to all significant airplane noise sources.

The ideal, of course, is not only the reduction of the impact of jet noise on sleep awakenings but on sleep stages, and going even further, on the quality of the airport/residential environment using as indices speech interference, rest, and comfort.

Cordially,

Robert Alex Baron

NEW TOKYO INTERNATIONAL AIRPORT AUTHORITY

2, Akasaka Aoicho, Minato-ku,
TOKYO 107, JAPAN

Mr. Charles R. Foster
Director of Environmental Quality
Federal Aviation Administration
Department of Transportation
Washington, D.C. 20591
U. S. A.

February 3, 1975

Dear Sir,

Thank you very much for sending me a copy of "Draft Environmental Impact Statement" which I think will be helpful for us to work out an appropriate environmental planning for the surrounding area of our airport.

Sincerely yours,

Bunta Okino
Consulting Staff
Corporate Planning Office

Telegrams: Britair Weybridge Telex Cablegrams: Britair Weybridge Telex: 27111

British Aircraft Corporation Limited

BROOKLANDS ROAD WEYBRIDGE SURREY KT13 0SF

TELEPHONE WEYBRIDGE 45522

E. E. Marshall
Director of Engineering
Commercial Aircraft Division

DE.4078

27th January, 1975.

Mr. C. R. Foster,
Director of Environmental Quality,
Department of Transportation,
Federal Aviation Administration,
Washington, DC 20591,
U.S.A.

Dear Sir,

We have read with interest the Draft Environmental Statement for a proposed Federal Aviation Regulation which would establish noise standards in the United States for all turbo-jet aircraft with a take-off gross weight greater than 75,000 lb.. Our general comments on the document have been incorporated into an A.E.C.M.A. paper which you will shortly receive.

I should like to clarify, however, the retrofit position for the BAC One-Eleven, which is reported on page 6 of the draft E.I.S..

The hushkits now being developed will allow the BAC One-Eleven series of aircraft to meet current I.C.A.O. Annex 16 requirements and tests are expected to demonstrate that F.A.R. part 36 can be met by the 200 Series One-Eleven. The production kits will be available twenty months from receipt of orders. To date no orders have been received.

Contd...

Further development work is being studied aimed at allowing other versions of the BAC One-Eleven to conform with FAR Part 36 although currently no date can be given on the availability of any such kits.

If there is any further information on this topic which you require, I shall be pleased to furnish it.

Yours faithfully,

FLY BAC ONE-ELEVEN WORLDWIDE

WEYBRIDGE 30 I 75 SURREY

GREAT BRITAIN POSTAGE PAID 15

MR. C. R. Foster,
Director of Environmental Quality,
Department of Transportation,
FAA,
Washington DC 20591,
U.S.A.

International Air Transport Association

AOA#: 3/4
ACTION/~~INFORMATION~~: AEQ-1
DUE DATES:
FOR SIGNATURE OF:
COORDINATION WITH/THRU:
INFORMATION COPY: AIA-1/APD-1

26th February 1975

IN REPLY QUOTE 4426

The Administrator
Fedeal Aviation Administration
800 Independence Avenue S.W
Washington, D.C. 20591
USA

Draft Environmental Impact Statement for Civil Airplane Fleet Noise Level Requirements

Sir,

Late last year we were invited to comment on the FAA's "Draft Environmental Impact Statement for Civil Airplane Fleet Noise Level Requirements". We reviewed the draft EIS with great interest and it raised many questions and points in our minds. Because of the short time between receipt of the draft EIS and the beginning of the fourth meeting of the ICAO Committee on Aircraft Noise (CAN/4), and because of our desire to study and comment on the draft EIS in depth, I regret it was impossible to let you have our views by 27th January. However, they have now been put together and are enclosed. I trust you will be able to take them into account.

2. Our review has identified a number of assumptions which we feel to be invalid. In addition, we question some of the philosophies adopted and make suggestions intended to remove some of our doubts about the validity of any conclusions which may be drawn in the final EIS.

3. We very much appreciate the opportunity to review the draft and hope our comments will be useful.

Yours very truly,

R.R. Shaw
Asst. Director General - Technical

RECEIVED

MAR 4 8 11 AM '75

Encl:

cc: C. Foster, FAA
J. Rudolph, FAA
Administrator, EPA
M. Kane, CEQ

IATA COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR CIVIL AIRPLANE FLEET NOISE LEVEL REQUIREMENTS

International aspect

1. At the outset, there is one point of principle we would wish to make most strongly and that concerns the international nature of the subject in question. It is stated quite clearly that, in respect of retrofit, all aircraft, U.S.- and foreign-registered, operating at U.S. airports would be required to meet FAR 36 without trade-offs, with the sole exception of foreign-manufactured four-engined aircraft. There exists, as you are well aware, an internationally agreed set of noise Standards, ICAO Annex 16, and regardless of whether any State's certification rules are more stringent than those of Annex 16, all ICAO States are obliged to accept foreign-registered aircraft at their airports if they comply with Annex 16 Standards. Although there are no ICAO Standards dealing specifically with "retrofit candidate" aircraft, it would in our opinion be clearly in contravention of the spirit of ICAO if the United States attempted to require foreign-registered aircraft to comply with stricter standards than those applicable to noise-certificated aircraft. Further, we consider it totally illogical to attempt to apply stricter standards to in-service aircraft than those applicable to future production of identical models. We therefore suggest that, whatever the U.S. decides ultimately in respect of U.S.-registered aircraft, no assumption should be made in the EIS that any foreign-registered aircraft would have to meet the Standards of FAR 36 without trade-offs.

2. On this general point, it is relevant to review the outcome of the fourth meeting of the ICAO Committee on Aircraft Noise (CAN/4). The Committee to all intents and purposes reiterated its Recommendation of nearly two years ago that "ICAO recommend and encourage " retrofit " of all subsonic jet aeroplanes ..... as are regarded by ..... State of Registry to be sufficiently effective and economically reasonable". During the discussion it was clearly stated by one member that his interpretation of this Recommendation was that, regardless of what it decided to do about the aircraft on its own Register, no State should try to impose a retrofit requirement on aircraft on the Register of other States. Indeed, CAN recognised that the Council of ICAO had already urged States not to take unilateral action on retrofit until ICAO had completed its study of the question and an international agreement applicable to all Contracting States had been reached through ICAO. In this respect, unilateral action has been defined in the report of CAN/4 as referring to the "imposition of retrofit requirement by a State on foreign-registered aeroplanes operating into its territory". The report also indicates that the Committee considered that severe operational restrictions (such as a total ban on non-noise-certificated aircraft) on aircraft on the Register of other States would be equivalent to imposing unilateral retrofit action against the aircraft of those States. For this reason, we question the principle of assuming that any foreign flag operation should be required by the United States to be retrofitted. However, as we point out later in this comment, we doubt whether it would make much difference to the noise exposure either way.

Public health

3. A second point of principle we would wish to make concerns the oft-repeated reference to health as well as welfare. The ICAO Special Meeting on Noise in the Vicinity of Aerodromes (1969) reached the following Recommendation which IATA completely supports:

"RECOMMENDATION 2/1 - RESEARCH ON THE EFFECTS ON HUMAN HEALTH OF AIRCRAFT NOISE EXPOSURE IN THE VICINITY OF AERODROMES

"That

a) it be acknowledged that aircraft noise exposure in the vicinity of aerodromes has not been demonstrated as being harmful to health or hearing and that evidence which might so identify it would be unlikely to come from other than long-range studies which, to the knowledge of the Meeting, have not yet been conducted; and therefore

b) selected States and International Organizations, including the World Health Organization, should be requested to actively pursue, and collaborate in, medical and psychological esearch on the effects on man of long-term exposure to noise such as occurs in the vicinity of aerodromes".

We are not aware of any evidence brought to light since then which would alter the conclusion of Recommendation 2/1a) above. Because of this we strongly disagree with the statement in the first paragraph of the introduction of the draft EIS, and repeated elsewhere, to the effect that the proposed regulation would "provide relief and protection to the public health". We wouldhope that the final EIS would be free of such contentious statements.

Land use planning and controls

4. As a third general point, we are very concerned by the thought expressed in the last sentence on p. 42 which we read as admitting that retrofit may reduce the need for land use planning and controls. We concede that it may reduce the amount of land for which use planning and controls are required, but utterly reject any suggestion that land use planning and controls will be less necessary if retrofit is implemented. In this respect, the 8th ICAO Air Navigation Conference, 1974, commented in its report that, if further encroachment of residential areas towards older aerodromes continued, it was likely that the benefits offered by aircraft noise certification, retrofit, and operational techniques might be negated. The Conference noted that the problems of the environment around aerodromes made it necessary for efforts to be pursued in every field to reduce their magnitude, placing particular emphasis on planning of urban development, and developed the following recommendation:

"RECOMMENDATION 11/2 - LAND USE PLANNING AROUND AERODROMES

"That States not already doing so should, to the extent practicable, take action to develop programmes for compatible land use administration and planning around aerodromes, in order to avoid incompatible development in critical noise areas, both around new aerodromes and in respect of still undeveloped areas in the vicinity of existing aerodromes".

Purpose of EIS

5. It is our understanding that the purpose of the EIS is to demonstrate whether or not SAM retrofit would provide meaningful relief to a significantly greater number of airport neighbours presently exposed to aircraft noise than would be achieved in the absence of a retrofit programme. In our comments on NPRM 74-14 we suggested that this would not be the case and nothing in the draft EIS causes us to change our opinion. In fact, all our comments on NPRM 74-14 generally remain valid.

Use of NEF

6. The entire study on which the draft EIS has been based has used the NEF as the noise unit for comparison of various noise reduction strategies. It appears that a certain amount of faith has been placed in the calculated absolute number of people/land area within the NEF 30 and NEF 40 contours. The concept of adding up the noise energy from a number of single events into a cumulative unit is accepted. However, the assumptions made in estimating cumulative noise exposure, especially when forecasting for some point in the future, are such that the calculated number may not be more accurate than within ±3 to 5 NEF of what would actually be the exposure in practice. Some of the factors which lead to this comparative inaccuracy are variability in actual operating weights, flight procedures, and atmospheric conditions, as well as the difficulty of accurately forecasting fleet mix and traffic growth. Thus, while the population within the NEF 30 contour in 1972 was calculated to be approximately five million (see p. C-26, Fig. 5) that number could be inaccurate by a factor of up to two. Past calculation methods have recently been found to have overestimated sideline noise by up to 15 or more EPNdB. It is suggested that estimations of people/land area within a given NEF contour as performed in the 23-airport study are likely to be significantly higher than would be the case if the contours were based on actual measurement of day-to-day operations. This in itself would tend to overstate the magnitude of the problem. We would suggest that the above points be brought out in a strong statement cautioning against too much faith in the absolute number of people/land area within the NEF 30 and NEF 40 contours.

Presentation of cumulative noise reductions

7. The only method used in the EIS to present the benefits from the various strategies is the reduction of number of people/land area within the NEF 30 and NEF 40 contours. While this method of presentation may not be without some uses, it does offer serious shortcomings and presents only part of the story. The main disadvantage is that it greatly over-exaggerates the apparent significance of any noise reduction. For example, a 15% reduction in land area, which to the layman would seem to be not insignificant, would probably be achieved by an overall reduction in noise exposure of about 1 NEF which, in actual fact, could not even be perceived.

8. In order to avoid the danger of a wrong decision being taken by people who may not fully appreciate this relationship, we suggest that an additional means of quantitatively presenting the results should also be included. The method we suggest is not a new one; in fact, it was used by Working Group A of the ICAO Committee on Aircraft Noise (CAN) in its report to the

third meeting of CAN in March 1973. It would involve counting up the number of people/land area within a given baseline area (say, the baseline NEF 30 contour) percieving greater than "X" NEF, and X could have a series of values such as 0, 2, 4, 6, 8, 10, etc. The results could be presented both airport by airport and as a total of all airports studied. Attachment 1 shows a format which might be used and which is extracted from the report of CAN/3. This information was derived simply from output data developed for a six-airport study by the United States in its activity supporting the work of CAN Working Group A.

9. We have also found it useful to present the same data in a graphical form and an example is shown at Attachment 2 which shows the way the data in Attachment 1 were presented to CAN Working Group A prior to CAN/3. The reason we believe that these additional means of presenting the results should be included in the EIS is that the people who are affected by aircraft noise will not really care whether a particular strategy moves them from just inside a contour to just outside that contour. What will really concern them is how much noise reduction they will receive if a particular strategy is adopted. Only if that reduction is large enough to be readily noticed and appreciated will they be convinced that the strategy was worth adopting and only if a significant proportion of those affected are so convinced will the strategy be worthy of serious consideration.

Effect of length of time required to complete retrofit

10. The draft EIS attempts to reach conclusions concerning the significance of noise reductions resulting from completion of a retrofit programme compared with the noise exposure in the absence of a retrofit programme. Whether the conclusions reached are valid or not, the fact that any such programme would be time-phased over a period of the order of five years, and the fact that any noise improvements would be only in small increments, could result in a lack of any perception of improvement by the public. Airport neighbours would certainly lose the contrast of a before/after change and, as a result, acoustic improvement would be even less likely to be perceived.

The effect if not applied to foreign flag carriers

11. Considerable emphasis is placed in the draft EIS on the assertion that the cumulative noise reductions would be significantly decreased if foreign flag operations were not required to comply with a retrofit rule. In support of this, the Table at the bottom of page 35 shows the number of foreign flag operations at a number of U.S. airports and their proportion of the daily total. However, it is not brought out that, especially at JFK New York (the airport at which both the absolute number and its proportion of the daily total are the highest) a significant number of foreign flag operations are conducted with aircraft which already meet Annex 16/FAR 36 and are therefore not retrofit candidates. If this Table (and argument) is to remain in the EIS then it should show just those numbers appropriate to retrofit candidate aircraft in the columns headed totals of international and foreign flag operations.

12. The point is made just above the Table that the numbers are appropriate to 1972. It is strongly proposed that a realistic forecast be made of similar numbers for the other benchmark years considered in the analysis, particularly 1980 and 1985. It is suggested that, by that time, the number of foreign flag operations using retrofit candidate aircraft might be an insignificant proportion of the total.

13. The Table on p. 36 purports to show the magnitude of the benefit lost if foreign aircraft are not retrofitted but does so at only one point under the approach path, being that for which SAM retrofit benefits are generally greatest. Contrary to what is suggested in the note to that Table, we believe a more exhaustive analysis is warranted, especially for the take-off case. Even for the approach we note the lost benefits at Los Angeles and Chicago are only 2 and 1 NEF respectively, which is hardly significant.

Timing

14. Various assumptions have been made in the draft EIS about the date by which complete retrofit would be possible. Most of these assumptions are, however, unrealistic in that they presume that only the U.S.-registered fleet would have to be provided for but, at the same time, base the noise reductions on the assumption that foreign flag operations will also be affected - the intention stated by the FAA both in NPRM 74-14 and in the introductory part of the EIS. If compliance by foreign flag operations is to be required, then the compliance date proposed is totally unrealistic. It may not be achievable even if confined to the U.S-registered fleet only, but we have not studied this problem within IATA. In this respect, the Table on p. B-3 certainly takes no account of kits required for foreign aircraft and may not take into account the capability of the airlines to install the kits.

15. It is also pertinent here to remark that, if a decision is taken to publish a retrofit rule within the United States, and if it is decided to make compliance with such a rule mandatory (by whatever means) for foreign flag operations, and if it is decided to have a 50% compliance date for such a rule as proposed, then the severity of such a provision will probably be a good deal stronger on foreign flag carreirs than on U.S. carriers. In such a case, we would have to protest most strongly against the competitive disadvantages of such a proposal.

Noise reductions for individual aircraft types

16. Although the method used for presenting benefits is based on the cumulative NEF unit, in certain parts of the draft EIS, particularly at the bottom of p.13/top of p.14, great emphasis is laid on the noise reductions for individual aircraft claimed to be possible from incorporation of SAM retrofit. We believe this emphasis is misplaced for two reasons. Firstly, certification take-off procedures assumed are themselves of academic interest only since they are not typical of those used in day-to-day operations. Secondly, the emphasis is laid on the reductions claimed to be achieved at the noise certification measurement points, but we would point out that the effectiveness of SAM modifications decreases with increasing distance from the aircraft to the ground. This reduction in effectiveness was demonstrated in the response of McDonnell Douglas to NPRM 74-14. The aircraft for which the largest reductions are claimed is the B.707 series and presentation of the reductions

in the McDonnell Douglas format would show this reduction in effectiveness to be a significant factor. Assessment of the B.707 would lead to a picture much like that shown at Attachment 3 for the take-off case.

17. In that part of the analysis concerning the noise reductions achieved through the use of FAR 36 type thrust cutback during take-off, no mention is made of the point at which climb thrust was assumed to be re-applied in order to enable the aircraft to accelerate and clean up. In the current IATA take-off procedure (which is similar to that developed by the FAA and ATA), acceleration and clean-up is commenced at 3000 ft AGL. Informally, we have understood that the 23-airport study did not assume re-application of climb thrust until 6000 ft AGL. The safety aspects of such an assumption are addressed in para. 23 below and we therefore suggest the assumption is unrealistic. For this reason, we believe that the study should, in fact, consider re-application of climb thrust at 3000 ft and we suggest that this would substantially change the conclusions concerning noise reductions. Indeed, it is pertinent to note that according to a calculation carried out by this Association a SAM-treated 707 at typical take-off weights, using the FAR 36 type thrust cutback at 700 ft and re-applying climb thrust at 3000 ft, would in fact make some 4 or 5 EPNdB more at distances greater than 70,000 ft from brake release than an untreated 707 at the same weight using the IATA take-off procedures.

18. In para. 24 below we raise doubts as to the flight acceptability of an inlet ring in some of the SAM designs for the sole purpose of reducing noise. The doubts are raised in respect of the effect of the ring on safety and reliability of service. If indeed it should be agreed that the ring should not be permitted, then the reductions due to SAM on the 707 in the approach might look very much as shown in Attachment 4. We would like to suggest that information for individual aircraft types should be shown in this format rather than in Table II-1 on p. 15.

19. While we are aware that final agreement has not yet been reached between the FAA and Douglas on the baseline noise levels of DC-8 series aircraft, we feel that the reductions assumed possible for the DC-8s, as shown in Table II-1, are overly optimistic. The reductions assumed by the FAA seem to have been based on what has been claimed possible for the B.707. Experience with the B.747 has shown the effect on noise of eliminating blow-in doors. Elimination of blow-in doors is also a feature of the B.707 retrofit kit. However, the DC-8s do not have blow-in doors in their baseline condition so that particular noise reduction element will not be available. Further, the DC-8-62s and -63s already have a long duct nacelle. For these and other reasons, we believe that noise reductions possible for the DC-8s are unlikely to be nearly as large as assumed in the draft EIS and suggest a re-work using more realistic values.

Flight operational procedures

20. As mentioned in para. 16 above, the noise certification take-off procedure will not be typical of day-to-day operations; nevertheless, the draft EIS appears to suggest that such a procedure should be used routinely in order to get maximum efficiency from SAM retrofit. In para. 23 below, a number of comments are presented which question the wisdom of adopting such a procedure on safety grounds. Until such time as all of the points raised

there have been examined, we do not believe that use of such a take-off procedure should be considered acceptable. We therefore suggest that the relevant sections should be deleted from the draft EIS and we note in passing that the benefits of SAM retrofit would therefore be much less than claimed to be readily achievable.

21. IATA has commented already on two-segment approach suggested in ANPRM 74-12 and, for much the same reasons as outlined above in respect of large thrust cutbacks on take-off, we would suggest that adoption of the two-segment approach as a possible strategy should not be addressed in the EIS.

22. The effect of removing both large thrust cutbacks on take-off and two-segment approach as potential strategies would delete from Figures I and II, pp. 23-30, all points except 1, 5, 9, 13 and 17. If this were done, we believe a totally different picture would be presented.

Take-off procedure

23. Much of the benefit claimed for SAM retrofit comes from the assumed use of a FAR 36 type thrust cutback during take-off. Considerable efforts have been made by the industry in recent years to standardize take-off procedures to the greatest extent possible. Elimination of variations in some of the parameters has, it is felt, contributed to an increase in safety levels in the take-off phase and for this reason the airlines are strongly opposed to any reduction in the degree of standardization. The current procedure being used by IATA Member Airlines (which is similar to that developed by the FAA and ATA) was developed taking into account many factors, one of which was the desire to minimise the noise exposure on the ground. If this procedure is to be changed to one using essentially a FAR 36 type thrust cutback, firstly this would have to be done for all aircraft types and on all occasions, and secondly the effects of all the factors (including but not limited to noise exposure) must be taken into account. In this respect we would comment as follows:

i) since FAR 36 type thrust cutback will virtually amount to the loss of one engine, it would be necessary to re-examine all existing departure routes (minimum noise routes, SIDs) to ensure adequate terrain clearance under these conditions;

ii) due to reduced altitude after cut-back, early turns (for example, for minimum noise routes) may be ruled out;

iii) current SID procedures, and the associated workload, favour use of the standardized take-off technique now in use, whereas revised take-off procedures would undoubtedly aggravate the workload problem;

iv) an encounter with a severe tail windshear during initial climb would usually require reduction of rate of climb to permit compensating acceleration. The available margin would be considerably reduced with a large power reduction. There is significant evidence of the occurrence of severe tail windshear which therefore raises questions about the safety of routine large power reductions during take-off while still close to the ground;

v) in busy terminal areas the reduced rate of climb resulting from a large power cutback shortly after take-off could be expected to generate additional ATC problems;

vi) there would be a risk of degradation of safety in adverse weather such as icing conditions or turbulence;

vii) the aircraft would be kept in a hostile traffic environment longer, increasing the exposure to collision or near-miss with other low altitude aircraft;

viii) unless climb thrust were to be re-applied upon reaching 3000 ft AGL, the time spent with a margin of only 10 kt above V_2 would be considerably lengthened. This might increase the presently acceptable small probability of stall to the point where it was unacceptable.

As mentioned in para. 20 above, until such time as all of the above factors have been examined, we do not believe consideration should be given to the effect of the FAR 36 type thrust cutback on the noise exposure: we suggest the relevant parts should be deleted from the draft EIS.

Ring in the inlet of JT3D nacelle

24. Much of the noise reduction claimed for the B.707 (and perhaps also the DC-8?) on approach is due to the inclusion of a ring in the inlet of the treated nacelle. While it may be possible to design and install a ring in such a way as to meet basic airworthiness requirements, it is suggested that there are potential effects on safety and operating reliability which would make it highly undesirable to have any hardware mounted in the inlet in this way. Certainly the proposed location of the ring would increase the work required for certain maintenance tasks on the engine and we believe that a much greater analysis of its acceptability should be undertaken before credit is given it for noise reduction in the EIS. As mentioned above in para. 18, the noise reductions for SAM modification of the B.707 would be substantially less than those claimed if the ring were not included.

Cost/benefit analysis

25. The draft EIS contains much detail on the estimated costs of a retrofit programme and then relates these costs to the benefits. The costs assumed are those relevant only to the U.S. carrier fleet. However, if the U.S. were to require compliance by all foreign carriers operating into U.S. airports, the total costs would be significantly greater. While it is true that theoretically not all of the aircraft of the affected types on the fleets of foreign carriers concerned would need to be retrofiteed, in order to retain their essential operating flexibility it is probable that in practice the entire foreign fleets of affected carriers would have to be retrofitted. This would probably make the total costs about double those for the U.S. fleet alone.

26. At the fourth meeting of CAN, recently concluded, the U.S. member presented a working paper (CAN/4-WP/56) explaining, among other things, the concept of ratio of marginal benefit to marginal cost. While we do not completely

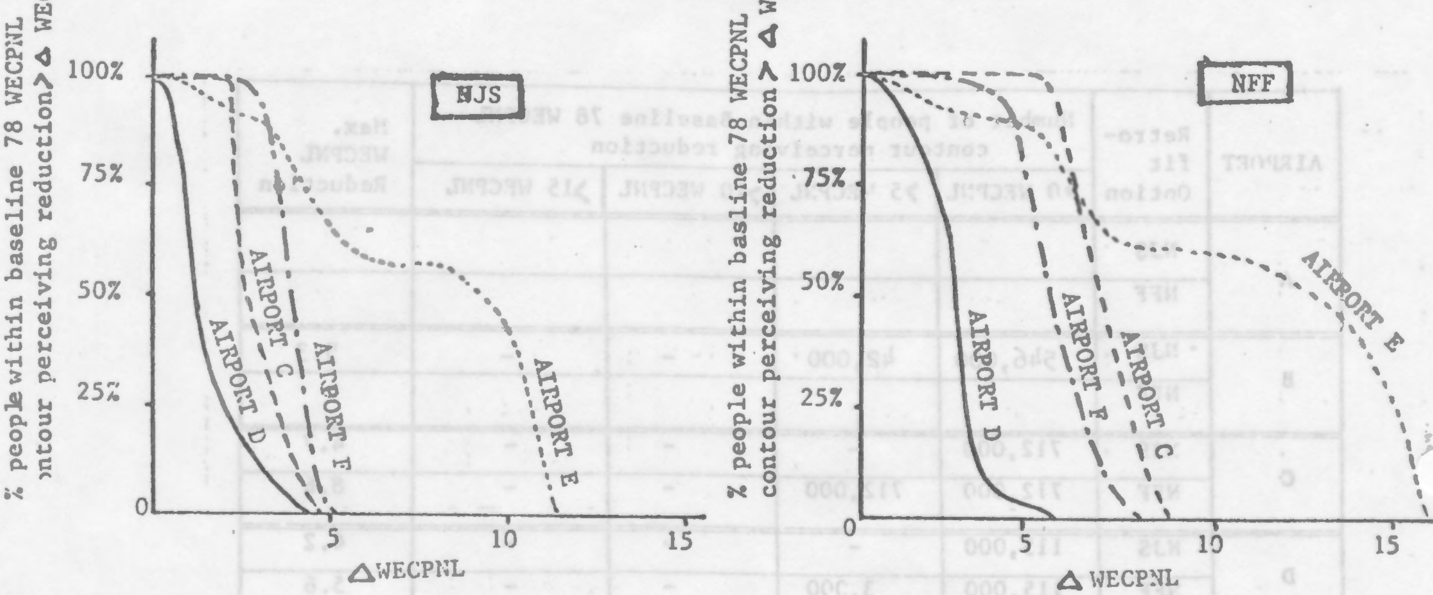
understand how the marginal benefits were assigned dollar values, it is quite clear that if the marginal costs were doubled, the ratio of marginal benefits/marginal costs would be halved. The paper makes the contention that any strategy having a marginal benefit/marginal cost ratio greater than unity is cost beneficial. In para. 4.5 of the paper, the ratio for SAM 3D/8D is shown as 1.4 However, if the total cost is taken into account, this might be reduced as low as 0.7 which would clearly not be cost beneficial according to the assumed criterion.

Estimated number of people within the selected baseline total noise exposure contour perceiving greater than a given noise exposure level reduction

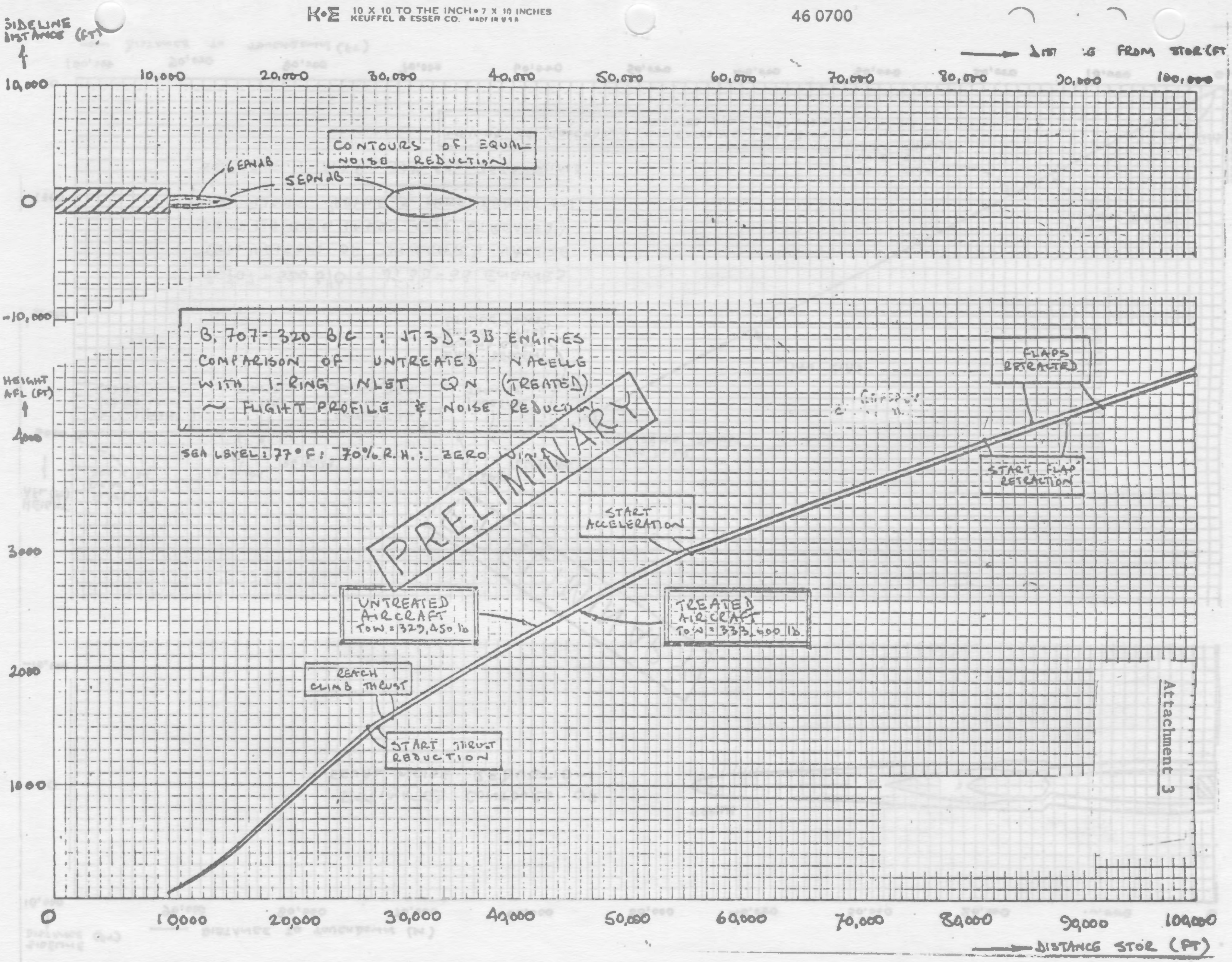
AIRPORT	Retro-fit Option	Number of people within Baseline 78 WECPNL contour perceiving reduction				Max. WECPNL Reduction
		>0 WECPNL	>5 WECPNL	>10 WECPNL	>15 WECPNL	
A	NJS					
	NFF					
B	NJS	546,000	42,000	-	-	5.3
	NFF					
C	NJS	712,000	-	-	-	4.7
	NFF	712,000	712,000	-	-	8.6
D	NJS	115,000	-	-	-	4.2
	NFF	115,000	3,000	-	-	5.6
E	NJS	177,000	116,000	77,000	-	11.4
	NFF	177,000	157,000	107,000	52,000	16.4
F	NJS	39,000	1,000	-	-	5.4
	NFF	39,000	25,000	-	-	8.0

NOTE: WECPNL is the ICAO unit of cumulative noise exposure comparable to NEF; NJS stands for nacelle and jet suppression which is roughly comparable to SAM plus an exhaust ejector; NFF stands for new front fan which is comparable to the refan alternative.

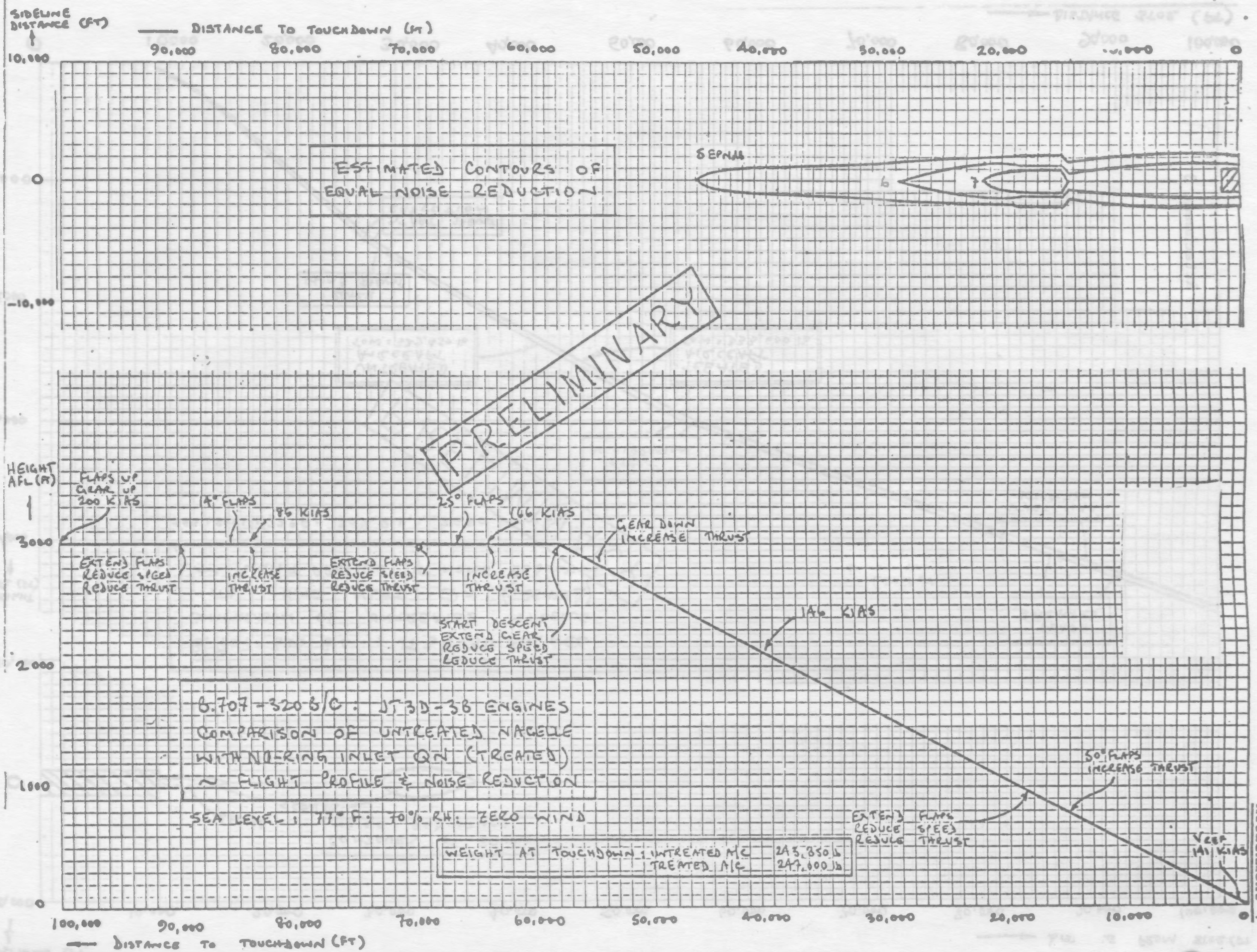
Number of people within the selected baseline total noise exposure contour perceiving greater than a given noise exposure level reduction



AIRPORT	Retro-fit Option	Number of people within Baseline 78 WECPNL contour perceiving reduction				Max. WECPNL Reduction
		>0 WECPNL	>5 WECPNL	>10 WECPNL	>15 WECPNL	
A	NJS					
	NFF					
B	NJS					
	NFF					
C	NJS	712,000	-	-	-	4.7
	NFF	712,000	712,000	-	-	8.6
D	NJS	115,000	-	-	-	4.2
	NFF	115,000	3,000	-	-	5.6
E	NJS	177,000	116,000	77,000	-	11.4
	NFF	177,000	157,000	107,000	52,000	16.4
F	NJS	39,000	1,000	-	-	5.4
	NFF	39,000	25,000	-	-	8.0



Attachment 3



Attachment 4

Air Transport Association OF AMERICA

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CLIFTON F. VON KANN
Senior Vice President
Operations and Airports

January 27, 1975

ACTION: AEQ-1
INFO: APD-1
1/28/75

Honorable Alexander P. Butterfield
The Administrator
Federal Aviation Administration
800 Independence Avenue, S. W.
Washington, D. C. 20591

Dear Mr. Butterfield:

The FAA forwarded a "Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements" to the Council on Environmental Quality on December 6, 1974. The Draft deals with Notice of Proposed Rulemaking 74-14, which would require within a small period of time a large number of jet transport aircraft to be retrofitted to meet the noise certification requirements of FAR Part 36 - without the use of existing "trade-off" allowances.

The Air Transport Association submitted to the FAA on June 28, 1974 the comments of its members relative to NPRM 74-14. We reaffirm the position expressed at that time, as much of those comments go to the heart of the Draft Environmental Impact Statement. In addition, we are providing in this letter, and its attachment, the comments of our members on that Draft.

Basically much of which is set forth in the Draft is unsupported as the cost to retrofit the airline fleet has not as yet been determined, the case has not been made that the small noise reduction benefit justifies the large expenditures indicated, the technology to retrofit is not fully developed and important safety issues have not been solved or even considered.

1. Noise Reduction Benefits

The portions of the Draft Statement that attempt to quantify noise reduction benefits for the proposed retrofit action utilize various superficial indicators that are misleading with regard to the scope of their applicability and their suitability as to the noise reduction which will actually be achieved. This consequently results in inferred benefits that are grossly exaggerated.

As we have pointed out in the past to the FAA, use of the FAR Part 36 aircraft certification methodology as a measure of merit for quantifying noise reduction benefits is faulty and misleading, especially when the claimed reductions are predicated on faulty information used to represent present noise levels of non-noise certificated aircraft (such as that contained in FAA Advisory Circular 36-1 dated May 31, 1973 and Figure I-1 of the Draft Statement). Table II-1 labeled "Noise Levels Under FAR 36 Certification Conditions," uses for baseline data values which are at odds with similar data available from other sources. What makes this significant, is the fact that the comparison, i.e., the benefit, for takeoff, is made at maximum gross weight, with the use of a "cutback" technique not compatible with present operating rules and practice. If the takeoff comparison is made under conditions corresponding to the existing operating rules and cutback procedures, the benefits become small or non-existent, because the procedure used in the comparison is different and because the baseline values shown are not representative of present levels.

For approach, the comparison is heavily sensitive to the flap setting chosen. Moreover, the data presented is really applicable to only certain configurations and submodels of the aircraft types identified. It is not revealed, for example, that a retrofitted B-737 approach value is obtained with a restricted landing flap setting of 30°. Several of these topics are discussed in the section herein dealing with applicability and availability of modification hardware to various aircraft subtypes as related to the use of "trade-off."

An even greater fault in using FAR Part 36 style data, as representing the benefits achieved is that the comparisons made at the FAR 36 measuring points are generally not representative of the reductions achieved at other locations within the influence of the aircraft flight path.

While an attempt is made to assess the benefit at other locations in a general way by the use of noise exposure contours, that approach also contains serious flaws. Among these are (a) the entire set of empirical routines used for extrapolating benefits to extended distances (especially to the side of the flight path), (b) the inability to account adequately for natural meteorological attenuating factors and (c) the flight procedure and airplane operating configuration assumed for the comparison. On the last of these points, for example, it appears that the exposure contours used for illustration in the Draft Environmental Impact Statement, and in the 23 airport studies used as a principal foundation for the Draft, do not reflect the use of reduced flap approach procedures already in use. The present contour plotting methodologies produce a product which does not truly have the sophistication that it implies. Perhaps the most deceptive aspect of the contour methodology, however, is the application of the area relationship "before" and "after" as an indicator of merit. This practice has the characteristic of making any, even small, change in source noise level look impressive. It has been demonstrated that a 1 dB reduction in noise reduces the so-called "impact area" by 15% or more; a modest 3 dB reduction results in about a 50% reduction in "impact area"; (a 3 dB reduction can barely be identified, if at all). The inference that the noise exposure, population annoyed, or the extent of the problem, is reduced by this same amount is not recognized as erroneous by the reader, otherwise knowledgeable, who does not have the detailed technical experience.

Other methods are available which, we believe, give a much less distorted pictorialization of the extent of the noise level reductions expected to be obtained by the retrofit options being considered under realistic operating conditions. The approach used by the Douglas Aircraft Company in response to Notice of Proposed Rulemaking 74-14 is particularly noteworthy. The use of the Douglas formula would show the realistic but small noise exposure area where actual improvement would exist.

Pursuing some points a little further in the case of the B-727-200 airplane, the Draft Environmental Impact Statement claims a 3.7 EPNdB reduction for takeoff (see Table II-1), again relying on the certification takeoff procedure which is not applicable to actual operation, as the FAA clearly points out in the preamble to its recent revision to FAR 36 concerning "acoustic changes." After citing a 5.6 EPNdB improvement on approach (for full flaps, also currently not used), a statement is made that such changes "will be perceivable to most observers." The choice of words is "perceivable to most", not "significant to most." The change is <u>not</u> significant to most, nor is it even perceivable to all. Indeed there exists <u>no evidence</u> that the benefits provided by the proposed SAM retrofit which is already installed on many newly produced B-727 airplanes now in operation, are in fact detected or appreciated by residents or that these newer airplanes are distinguishable in this respect.

The quotation from the National Research Council on page 14 of the Draft relies upon the Borsky Report cited directly beneath it. The Environmental Impact Statement leaves the reader with the impression that real aircraft were used in the tests by stating "This reduction was perceived by test subjects who live in the Kennedy International Airport environment and was achieved with a difference of 6 EPNdB between the two aircraft." The facts are that the tests were in a simulated living room with noise tapes synthesized to represent the B-727 with SAM. We do not fault the Borsky Study, but the FAA citation that "there was a 50% reduction in the number of test subjects who had expressed highest annoyance," while technically correct, leaves the wrong impression of the annoyance reduction achieved. The average annoyance was, in fact, reduced by a value less than the difference between annoyance scale units used. In the construction of the tests, the scale units chosen and the deliberate exposure of subjects to levels higher and lower than, as well as their own location levels, forced shifts in scale ratings. Finally the Draft neglects to identify these tests as applicable only to the approach noise of B-727. Dr. Borsky has made it very clear that the conclusion of this study only applies to the B-727 during the approach configuration. His conclusion applies to no other airplanes.

2. FAA Proposed Compliance Schedule

Based on current information furnished by the manufacturers regarding lead times to begin delivery of SAM retrofit kits and based on the fundamental assumption (accepted by the FAA) that installation will occur during routine extended periods of maintenance, such as overhaul which for some aircraft models occur at intervals greater than the 5 year for each individual aircraft, the airlines point out that the compliance schedule proposed by the FAA -- even the revised schedule of 36 months to intermediate compliance and 48 months to complete compliance -- cannot possibly be met, short of prematurely retiring or grounding a sizeable portion of their fleets, thus greatly increasing the cost of a retrofit program.

The manufacturers are currently quoting the following lead times to commence delivery of SAM retrofit kits for their respective aircraft:

B-707-120B	33 Mos.	B-747	12 Mos.
B-707-320B/C	26 Mos.	DC-8-51/61	31 Mos.
B-720B	34 Mos.	DC-8-62/63	31 Mos.
B-727	18 Mos.	DC-9	22 Mos.
B-737	18 Mos.	BAC-111	20 Mos.

Further, it should be recognized that a period of 2 to 3 months will elapse from the date of rule effectivity to the date that the airplane manufacturers issue a "go-ahead" for their respective programs, during which time the individual affected airlines decide how they will comply with the rule, make the financial arrangements and carry out contract negotiations with the individual manufacturers. On the other hand, the manufacturers may not issue a "go-ahead" until after they are certain of air carrier needs.

Deducting the manufacturers' lead times together with the period between rule effectivity and manufacturer "go-ahead" from the 36 months for intermediate compliance and from the 48 months for full compliance, clearly will leave insufficient time for the airlines to carry out the required installations.

As a consequence of the FAA's unrealistic proposed compliance schedule the rule, which is the basis of this study, clearly does not satisfy the criterion of technical practicability.

Basic questions arise on the practicability of application of SAM as demonstrated only on four basic airplane types out of a total of ten. While we are aware of studies applying a prototype B-707 SAM installation to the DC-8 series, actual production hardware has not been built or tested for <u>any</u> JT3D powered aircraft to verify theoretical analyses of fully-modified aircraft. Thus, no accurate data are available regarding performance degradation, reliability deterioration and effect upon inherent <u>safety</u> characteristics. Further it has not been demonstrated that proposed retrofit designs for JT3D powered aircraft will meet FAR Part 36 levels.

It should also be pointed out that while certain specific models of the B-727 and DC-9 have SAM configurations which have been certificated and are in production, application of these SAM configurations to other models of the same aircraft will <u>not</u> permit compliance with FAR 36 <u>without "trade-off" allowances.</u> Furthermore, the B-737 with a quiet nacelle installation, which is identical to its proposed SAM retrofit configuration <u>cannot</u> comply with FAR 36 without "trade-off."

In short, since the technical aspects of retrofit of many affected aircraft types are still vague and tenuous and have not been demonstrated, we are certain that the FAA's proposed compliance schedule is impossible to meet. Thus, the FAA's sweeping conclusions concerning the amount of noise reductions and that there will thus be meaningful relief is greatly in error.

3. Trade-Off Allowance

Throughout the Draft Environmental Impact Statement, the FAA indicates that the retrofit of aircraft owned by U. S. airlines must be made to comply with FAR Part 36 without the "trade-off" permitted by Part 36 as now written.

As we understand the Notice of Proposed Rule Making (NPRM) on which the Draft Environmental Impact Statement is based, this means that if an aircraft as a series were certificated as meeting Part 36 (with or without trade-offs) prior to March 27, 1974, the date on which the Notice appeared in the Federal Register, that series of aircraft could continue to be manufactured, delivered and operated using trade-offs. Older individual aircraft retrofitted and certificated as meeting Part 36 (with or without trade-offs) prior to March 27, 1974 would be similarly treated and could continue to be operated using trade-offs. Those individual aircraft which were not certificated to meet Part 36 noise levels prior to March 27, 1974 would have to be retrofitted. To be certificated the retrofit kits for these individual aircraft would have to meet the Part 36 noise levels without using trade-offs.

The result would be two categories of the same model aircraft each with a different noise level. One category would be those that meet Part 36 because they were certificated before the date of the Notice and therefore were allowed to use trade-offs. These aircraft, some of which would be identical in all respects with those subject to retrofit, would be noisier than the latter since trade-offs could not be used in certificating retrofit kits installed on aircraft subsequent to the date of the Notice.

Trade-offs are of miniscule benefit to the airport neighbor. But they are essential if manufacturers are expected to produce and warrant that the hardware they deliver to the airlines will do what it is supposed to do. Technology is just not that precise. Anyway, a trade-off is not a license to make more noise across the board, an excess at one point has to be made up at another.

To the airlines trade-offs are needed for many reasons depending on the type of operation involved. One of the reasons they are needed is to avoid an unnecessary inventory of spare engines. Although it is conceded that most retrofitted engines/nacelles can be intermixed with untreated ones on the same aircraft without technical difficulty, FAA will not allow an engine to be substituted, even in an emergency, on an aircraft if the installation of that engine will increase the noise level of the aircraft (FAR 21.93(b)). A letter dated August 27, 1971 from the Director, Flight Standards Service to ATA's Director of Engineering emphasized the fact. Thus, a third category of aircraft is introduced --i.e., an aircraft certificated to meet Part 36 prior to March 27, 1974 with the use of trade-offs but fitted with one or more engines/nacelles taken from an aircraft of the same model which has been retrofitted and which met Part 36 without trade-offs. In view of the aforesaid FAA ruling that a quieter airplane cannot be made noisier, the converse would not be permitted -- i.e., an engine/nacelle from an aircraft certificated with trade-offs could not be installed on an aircraft certificated without trade-offs.

It is easy to see the logistical burden and cost increase an airline must incur if trade-offs are deleted. Many of their spare engines would cease to be usable on all aircraft of the same type. The alternative to acquiring more spare engines, amounting in some cases to duplicating spare parts, is to hold an aircraft at a given station until an engine, comparable noise-wise to the one experiencing mechanical difficulty, arrives from another station. Such an impingement on public service cannot be justified by the negligible noise reductions achievable by eliminating the trade-offs.

Another example of the importance of trade-offs to the airlines is the effect that abolishing them will have on some of the cargo aircraft. The cargo version of the DC-9-33 aircraft is equipped with JT8D-9 or JT8D-11 engines. Elimination of trade-offs will place a special burden on operators of this aircraft. The manufacturer advises that without trade-offs a retrofit meeting the specified noise levels with the available kit is out of the question. This being the case the only way compliance can be achieved would be modifying the engine to a JT8D-15 configuration. Such a requirement is surely impracticable, unnecessarily costly, and outright unreasonable when it is noted that the failure of this model DC-9 to qualify is due entirely to its inability to achieve truly insignificant reductions in the take-off noise level. Not only is the noise reduction to be achieved meager at best, in those cases where nearly all take-offs are over water, as in the Hawaiian Islands, there would be no benefit at all from engine modification. In a word, the investment will achieve nothing.

A more disturbing result of deleting the trade-off provision is illustrated by focusing on what would have to be done to comply with the rule in the case of the B-737 which cannot meet the noise levels using SAM retrofit kits unless trade-offs are permitted. There are no additional hardware options available to the manufacturer that would bring this aircraft into compliance without trades, even when retrofitted with the most extensive SAM available. The only way it could qualify would be by accepting operating limitations. On landing it would have to utilize no more than a 30 degree flap setting rather than maximum landing flap setting. When operated into some airports this would be coupled with a severe reduction in landing weight. For example, such an aircraft equipped with a JT8D-7 engine would have its landing weight reduced by some 14 to 17 thousand pounds. The service penalty to the public in this case should be apparent. But that is not all. B-737s are used extensively in remote, mountainous areas of the U.S. where runway lengths, of necessity, are relatively short, thus requiring a full landing flap setting. No one knows better than FAA the safety considerations arguing against such operations with reduced flap setting. To put it another way - the level of safety of operations in the B-737 will be reduced.

Deletion of trades therefore will decimate service to the hinterlands where there are no serious noise problems and unnecessarily reduce the safety margin of such operations without, in practical terms, reducing noise by a decibel.

FAA has not stated the basis for proposing the deletion of trade-off, perhaps out of recognition that it would be hard put to justify the proposal especially when the requirements of Section 7 of the Noise Act are taken into account. But even if there were an ostensibly rational basis for the proposal, there is no way that such minute noise reductions could weigh heavily against the penalties portended for airline operations and thus public service. It follows that if the rule is adopted the trade-off provisions of Appendix "C" to Part 36 must be retained. And even more important with respect to the Draft Environmental Impact Statement and the alleged "benefit" calculation contained in the Draft, the noise levels "with trade" used in calculating the land areas and persons within such areas must be redone. The Draft indicates on page 35 that "the FAA will consider on a case-by-case basis, any specific aircraft or configurations of aircraft that must use trade-off . . .". Experience on such matters in the past have indicated this is not practical. On the other hand - if the FAA sincerely means to provide relief and permit the use of trade-off - for safety or other reasons, again the calculation of land areas and persons within certain noise level contours has to be redone.

4. Safety of Proposed Takeoff and Landing Noise Abatement Procedures

The Draft Environmental Impact Statement makes a number of references to reducing noise by requiring two types of operational procedures: (1) the 2-segment approach and (2) a takeoff using "cutback".

The airlines, with FAA's concurrence, have been using a noise abatement takeoff procedure with "cutback" at 1500' since August 1, 1972, and a reduced flap approach procedure since September 1972 - both of which reduce noise levels received on the ground near the airports. However, the airlines are deeply concerned about the safety aspects of the 2-segment approach advocated by FAA in Advance Notice of Proposed Rule Making (ANPRM) 74-12 and any takeoff procedure that would require "cutback" below 1500' above the airport elevation.

We find the ANPRM on 2-segment approach deficient in the flight safety area on a number of counts. Some of these are:

(a) With several aircraft types, notably the DC-8, B-747 and DC-10, flight idle thrust is required to remain on the profile, thus greatly reducing or negating anti-icing capability.

(b) As given in the previous example, excessively high sink rates and accelerating airspeeds are encountered with some aircraft. This needs much more evaluation.

(c) Other aircraft types not now in evaluation need to be examined, particularly with regard to the upper segment definition, which the airlines feel will vary by aircraft type.

(d) Well over one half of all air carrier jet losses and fatalities have occurred in the approach and landing phase of flight. For this reason, the airlines are extremely cautious about adding any degree of complexity or complication to this phase of flight. Proponents of two-segment approaches argue that providing DME in conjunction with ILS and/or adding RNAV equipment to the aircraft will result in a level of safety for two-segment approaches at least equivalent to that for conventional ILS approaches with current equipment. This reasoning is extremely speculative in view of the limited testing done to date. Moreover, one could very logically argue that installation of this same equipment, without the complication of the two-segment transition maneuver, would significantly improve the reliability and safety of conventional, one-segment ILS approaches. The interrelationship of electronics, safety, and approach complexity must be thoroughly explored to accurately determine the actual flight safety implications of two-segment approaches.

(e) Two problems dealing with weather and safety are important. The first deals with wind shear. A tail wind at altitude will reduce thrust requirements on the upper segment. Couple this with an icing problem, the resultant power required may not be adequate to operate anti-icing systems even though the auto-coupler can maintain the glide slope.

(f) There is a serious safety problem involved with respect to the wake turbulence caused by the aircraft on the first segment of a two-segment approach as that turbulence relates to non-airline aircraft using the 3^{o} glide slope. We are aware of the FAA/NASA program regarding this matter but it needs further pursuing and checking out in order to assure safety of all operations.

There have been various proposals for a takeoff "cutback" procedure to be used in day-to-day operations, including cutback at 700' for 4-engine jets and 1,000' for 2-and-3-engine jets, as permitted under Part 36 for meeting the noise certification test requirements. What all of the various proposals fail to take into account are the safety of the aircraft, crew, passengers and those residing under the flight path.

Here are some of the considerations.

First and foremost, a single standardized takeoff procedure is needed for safety reasons.

As far as performance requirements are concerned there are four basic types of takeoffs. There is: (1) the all engines, obstacle limited takeoff, (2) the all engines, non-obstacle limited takeoff, (3) the engine out, obstacle limited takeoff, and (4) the engine out, non-obstacle limited takeoff. If a single procedure is to work it must take care of all of the above kinds of takeoffs, and it must provide:

- adequate stall margins
- adequate controllability margins
- adequate maneuvering margins
- adequate gust and wind shear margins
- comply with anti-noise requirements
- be economically feasible and practical from a fuel consumption and engine performance viewpoint.

Such a procedure is not developed overnight. It requires hard work and study of each airplane type regarding climb gradient curves, stall and maneuvering speeds, regulatory performance requirements, etc. Then flight test work has to be done, followed by a good shake down in actual practice. A good procedure cannot be derived without such preparation.

Our point in bringing these safety matters to the FAA's attention is to be certain that everyone is aware that the two-segment approach, and a "cutback" procedure on takeoff, different than that now used by nearly all of the airline members of ATA, will not be forthcoming in the near future, if at all, because of very serious safety considerations and decisions that must be made. Therefore, we feel it is far too premature to set forth in the Environmental Impact Statement any indication of how noise on the ground may be reduced by such procedures. Thus, the various Tables and Figures in the Draft Environmental Impact Statement showing the cumulative noise reduction using these procedures should be deleted.

In summary, all the noise reductions assumed to be the result of the use of such procedures is still pure theory and far, far from ever becoming fact.

5. "Public Health and Welfare"

In several places in the Draft Environmental Impact Statement, reference is made to aircraft noise levels as related to "public health and welfare." The prime document allegedly dealing with noise levels as related to public health and welfare is EPA's document, 550/9-74-004, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." We do not believe that the basis for the maximum acceptable dB levels set forth in that document is sound. Even the document itself refers to assumptions, extrapolations and interpolations which had to be made to arrive at the levels set forth (i.e., 70 L_{eq} re hearing loss, and 55 L_{dn} re annoyance). We recommend, therefore, that any reference to "health and welfare" in the Environmental Impact Statement be deleted until there is an agreed upon, scientifically proven, and fully recognized basis for establishing any noise levels associated with the phrase "public health and welfare."

6. Fuel

The Draft Environmental Impact Statement contains a section on fuel consumption which tries to show that only a small increase in fuel consumption would occur with the installation of the SAM treatment to the existing non-Part 36 jet transport fleet. Using the FAA figure of 4,000 barrels a day of added fuel required with the SAM installations (see Page 23, line 6 of the Draft Environmental Impact Statement) we are of the opinion that such increased fuel consumption is quite alarming. 4,000 barrels a day means 1,460,000 barrels, or 61,320,000 gallons, of jet fuel per year.

The President's program is to reduce U. S. petroleum product consumption so as to reduce the import of 1,000,000 barrels a day from foreign sources in 1975. The 1,460,000 barrels a year required because of SAM would be about 1-1/2 times that amount. Instead of helping the President's program, a SAM requirement would hinder it considerably.

Further, 61,320,000 gallons of jet fuel is approximately the amount of fuel needed (a) to operate either of two of our larger local service air carriers for one year and (b) the same amount would be more than enough for the combined operation for a complete year of three of the smaller members of the Association.

An ineffective and costly retrofit program which will also increase fuel consumption is indefensible.

7. Safety

The Draft Environmental Impact Statement gives little, if any, recognition to several serious safety problems which have to be taken into consideration and solved before certain operating procedures and certificated hardware features can be used in calculating noise benefits. We refer to:

(a) The need to use 30° landing flap instead of "full flap" with a B-737 to meet Part 36 without trade-off, thus, causing a reduction in the landing runway length safety factor. (See comment 3. Trade-Off Allowance.)

(b) The proposal to use "cutback" below 1500' above airport elevation during takeoff. (See comment 4. Safety of Proposed Takeoff and Landing Noise Abatement Procedures.)

(c) The proposal to require a two-segment approach. (See comment 4. Safety of Proposed Takeoff and Landing Noise Abatement Procedures.)

(d) The SAM retrofit proposal for the B-707-320B/C, the B-707-120B and the B-720B requires an acoustical "ring" in the engine inlet. The airlines feel that these are inherently unsafe from an airworthiness point of view.

Safety is most important to the airlines. It is necessary for the FAA to assure the safety of noise abatement hardware and procedures. The airlines are of the impression that this has not been done as yet and thus indicated alleged noise reduction benefits to the public as set forth in the Draft are misleading.

Some additional page-by-page detailed comments are attached. Most of these refer to comments contained above. Others are set forth for the first time in the attached.

The airlines appreciate the opportunity to comment on this Draft Environmental Impact Statement, and hope our comments will be of value to the Agency.

Sincerely,

Walter A. [signature]

for Clifton F. von Kann
Senior Vice President
Operations & Airports

Attachment

Attachment

ATA Detailed Comments on Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements

1. Page 2 in the last sentence including the Table of Airplanes and Certification Dates - the word "initial" should be inserted before the word "certification." This suggested change need not be made if the table at the end of the page would include the certification dates for the various subsequent models of the airplanes listed. Listing the certification date of the later models would be preferable.

2. Page 3, third line. It is indicated here that the "open circles signify estimates" in Figure I-1. New data is available which would indicate many of the levels indicated on Figure I-1 are incorrectly high.

3. Page 3, the second sentence indicates that Figure I-1 shows that appropriate reductions to meet Part 36 noise levels are achievable. The point is that the retrofits being assumed are not technical available now for six of the basic aircraft models.

4. Pages 2 and 3. The FAA statements that 1,969 of 2,419 (page 2) currently operating aircraft do not meet FAR 36 noise levels and the estimate that 1300 to 1600 (page 3) of these will still be operating "through the '70s" is essentially irrelevant to the case for SAM retrofit. Even though SAM retrofit could allow most of these aircraft to meet FAR 36 noise levels, the fact remains that, even with this retrofit, the aircraft which make in excess of 85% of all U.S. takeoffs and landings (JT8D-powered aircraft) would still not offer noise relief detectable by the public.

5. Page 3, fifth last line. To our knowledge, there is no basis for the assumption made in this sentence.

6. Page 5. The first sentence in the first full paragraph indicates "a safe and practicable application of acoustic technolgy has been developed . . .". The airlines question the safety of the SAM retrofit developed for the 707 series of aircraft. In addition, there is no "practicable application" developed and tested for the two basic DC-8 models.

7. Page 5. In the middle of the page, it is indicated that SAM treatment has been demonstrated as technically feasible to retrofit engines/nacelles to meet FAR Part 36 noise levels. Your attention is called to the fact that the SAM retrofit proposals are not available however for six of the basic aircraft types involved. In that same paragraph the point is made that the JT3D powered B-707, with SAM treatment, have been demonstrated to meet Part 36 levels. Only a "two ring" inlet prototype has been used. The airlines question the safety of this arrangement. It is further noted that the work done on the B-707 is not applicable to either of the basic models of the DC-8s. The FAA indicates in the second last line the "general manner" in which the 707 acoustic treatment as used in 707 could be used in the DC-8. It fails to point out that absolutely no SAM retrofit hardware has been developed, or either ground or flight tested for the DC-8 aircraft.

8. Page 5, paragraph at the bottom of the page. This paragraph fails to indicate that one DC-9 model and the B-737s can not be certificated to meet Part 36 levels without trade-off allowances. We also understand the B-727 furnished with JT8D-7 and -1 engines can not meet Part 36 levels without trade-off.

9. Page 6, paragraph in the middle of the page. This paragraph would indicate that retrofits can be made during routine overhauls and that engine intermix is possible (that is one aircraft could be equipped with both non-retrofitted engines and retrofitted engines and used in airline operations). Reference is made to the retrofitting of JT8D with burner-can for emissions. In the case of the SAM retrofit this would be prohibited from an aircraft certification point of view as well as unsafe from an operational point of view.

10. Page 7. This page deals primarily with compliance dates. FAA is still indicating that questions of manufacturing capacity and logistics are still under review. We, therefore, find it difficult to see how the compliance dates of 36 months and 48 months from the effective date of the regulation were determined if these points are still "under review." The information we received from the manufacturers and set forth in our comments entitled FAA Proposed Compliance Schedule indicates that a final compliance date of 1982 or later may be in order.

11. Page 9, paragraph in the middle of the page. The FAA indicates that its proposed retrofit rule would only apply to aircraft operated by foreign carriers into and out of the United States. Such a rule would place U.S. Flag carriers in a bad competitive position insofar as those routes between foreign terminals are concerned. For example, between Rome and Bombay where foreign Flag carriers using aircraft that do not enter the U.S. are competing with U.S. Flag carriers which would have to use aircraft which are retrofitted.

12. Page 9, paragraph B at the bottom of the page. Again we point out that the B-737, certain models of DC-9 and B-727 cannot meet Part 36 without trade-offs.

13. Page 10, paragraph D. If foreign manufactured 4-engine airplanes need not comply with Part 36 but only meet ICAO Annex 16, U.S. carriers operating 4-engine aircraft are being discriminated against by the regulation. This is true because Annex 16 is less strict than Part 36. In addition, Annex 16 permits trade-off where the proposed rule would not permit the use of trade-off provided in Part 36 for U.S. 4-engine aircraft.

14. Page 13, second full paragraph. The phrase "meaningful relief" appears twice in this paragraph. As noted in our comments entitled, Noise Reduction Benefits, we do not concur that "meaningful relief" will be provided by the SAM treatment.

15. Page 13, last paragraph. The statement here indicates that there is an 11 EPNdB reduction on takeoff for JT3D powered aircraft. This is true only for the B-707 type aircraft when flown with "cutback." It is not true when flown in accordance with FAA recommended noise abatement takeoff procedures. The Dulles tests showed that when the B-707 took off without "cutback", the difference is on the order of 2.8 to 3 EPNdB reduction. Further, the 11 EPNdB reduction is not true for DC-8 aircraft which are equipped with the JT3D engines. For the JT8D powered airplanes on takeoff, when they are flown in accordance with recommended noise abatement takeoff procedures, the reduction for some models is zero.

16. Page 14. In our comments entitled, Noise Reduction Benefits, we have discussed the validity of Dr. Borsky's tests and their meaning.

17. Page 15, Table II-1. With regard to the column entitled, "Present (Baseline)," the data listed appears to be old data. It should be updated.

The column entitled "Retrofit" is misleading for some airplanes, as the numbers indicated are "estimated" because hardware is not developed, much less having been flight tested. For example, in the case of the DC-8, there are no actual retrofit noise levels available. The B-737 data for landing is with a 30° flap and for safety reasons we need to use a 40° flap.

The asterisk along side of the word "takeoff" in the first column deals with a "cutback" procedure, which the airlines feel is inappropriate.

18. Page 16, first full paragraph. A reduction of 3.7 EPNdB on takeoff for the B-727-200 can only be accomplished with "cutback" which the airlines do not use, thus the statement here is misleading. The last sentence of that paragraph gives the impression that with retrofit the improvement in magnitude of noise and the quality of the frequency spectra will be perceivable to most observers. It is interesting to note that there are a fair number of 727-200 series aircraft which meet Part 36 operating in the scheduled airline fleet today, yet no recognizable difference or improvement has been noted by the public. As far as the public is aware all the B-727s are alike from a noise standpoint.

19. Page 16, second full paragraph. The Dulles demonstrations showed that when flown using FAA recommended takeoff procedures, the difference between retrofitted and non-retrofitted B-707 was between 2.8 and 3 EPNdB and not 11 EPNdB.

20. Page 16, last sentence beginning on the page. This sentence leaves the impression that new wide-body jets, such as DC-10 and L-1011, provide lower noise levels at the noise certification measuring points than the smaller 2-and-3-engine jets such as B-727, DC-9 and B-737. The B-727 noise levels without SAM at some measuring points are lower than the L-1011 and DC-10, and at others are so close to wide-body levels the difference is imperceivable.

21. Page 17, last sentence of the first full paragraph. As we point out in our comments entitled Noise Reduction Benefits, it is the reduction in the noise level which the person on the ground actually perceives that is important; not the reduction in the so-called area of noise impact achievable through retrofit.

22. Page 18 and 19. It is noted that "power cutback" as permitted by FAR Part 36 provisions is used in Figures II-1 and II-2. Our comment entitled Safety is appropriate here. Noise certification

test "cutback" altitudes should not be used in preparing these charts. The airlines do not use "cutback" permitted during certification.

23. Page 23, beginning with the sentence commencing at the bottom of the previous page and continuing on to the top of this page, it should be noted that the existing Los Angeles International Airport procedure for night operations makes no differentiation between those aircraft that meet Part 36 and those which not not meet Part 36. Since April of 1974 all aircraft, whether they meet Part 36 or not, follow the same procedure. Thus, this sentence should be eliminated.

24. Page 23, first full paragraph. This paragraph should be eliminated at this time for the reasons set forth in our comment entitled Safety of Proposed Takeoff and Landing Noise Abatement Procedures.

25. Page 28, first full paragraph, last sentence. We are encouraged by this sentence because it indicates that safety and efficiency will have to be considered along with noise benefits. On the other hand, until safety has been assured for takeoff with "cutback" and using a two-segment approach through the rulemaking process, as we indicated in our comments in the basic letter, supposition of noise benefits should not be made through the use of takeoff or approach procedures that have not yet been agreed upon. In other words, the Environmental Impact Statement should be limited to the matter of noise reduction expected through retrofit.

26. Pages 29 and 30. These charts should be deleted as we indicated in the second paragraph on pages 9, 10 and 11 of our commenting letter. Safety is our prime concern. However, the use of NEF 40 and 30 in these two charts are misleading units as well.

27. Page 31, paragraph beginning on page 28. Here again much is made of the fact that additional benefits through power cutback will be provided. Safety is involved here and has not been taken into account.

28. On Page 34. In the first full paragraph which continues onto the next page, it is indicated that the FAA has a policy to increase the stringency of Part 36 where it is technologically practicable and economically reasonable and then it refers to the fact that this can be done in the retrofit situation by eliminating the trade-off provisions of Part 36. As indicated in our comment on

"Trade-Off Allowances," eliminating trade-off is not technologically practicable and economically reasonable.

29. Page 39, first full paragraph. We merely restate the fact that SAM modifications do not provide meaningful relief.

30. Page 42, second paragraph. It is indicated here that the retrofit rule would assist local jurisdictions in quantifying potential noise exposure by assuring maximum bounds on source noise. This simply is not true as the use of NEF contour and single event footprints give completely erroneous and misleading information to land use planners. Until the NEF formula is appropriately corrected, it will mislead anyone that uses it, or counts on its use. We understand that the aircraft manufacturers and airport operators generally concur with this viewpoint.

31. Page 43. See our comment entitled "Fuel."

32. Page 44. The FAA expresses an opinion here that the proposed retrofit does not involve any trade-offs between short-term environmental gains at the expense of long-term losses. Such a statement in view of the airlines is simply not true. Any money committed now to retrofit is capital made unavailable to buy new truly quieter and more fuel-efficient aircraft. This is true regardless of where the financing comes from; capital is capital, and it is scarce. Omission of this realization would have a long-term negative economic impact upon the aircraft manufacturing industry, as well as the air transport industry. Commitment to retrofit represents therefore, at best, a modest short-term environmental gain at the expense of potential long-term gains, both environmental and economic.

33. Page 45. The first paragraph on this page states that there are no adverse land use patterns being established as related to the proposed retrofit rule. We challenge this statement, using as an example for rebuttal the situation involving the Port of Oakland, the City of Alameda, California, and the developer of Harbor Bay Island, a major development immediately adjacent to the principal air carrier runway at Oakland International Airport. A principal justification for continuing this obviously incompatible land usage is reliance of its proponents on the probability of retrofit and its ability to make the area compatible.

34. Page 45. The third sentence indicates "There are no known risks to health and life anticipated" through the adoption of the proposed rule. As we have indicated in several places in this attachment as well as under the "Safety" paragraph in our covering letter, there are several safety matters and therefore "risks to life" which have not been solved as yet.

35. Page 46. The Table set forth on this page relates to part of the FAA's argument that raw materials for use in retrofit are currently not in short supply. We call your attention to "polyimides" which is a petrochemical and thus is in short supply. Other items listed, though they may not be in short supply, are difficult to obtain and this is one reason why the airframe manufacturers have indicated that the time element in preparing the first retrofit kits and subsequent kits has been lengthening over the past two years, and will probably do so in the future.

36. Page 47. The first paragraph indicates again that there will be "large measure of noise relief." As we have indicated earlier, this simply is not true.

37. Page 47, second paragraph. There is no question but that the aircraft noise is a major problem in impeding the orderly development and operation of air transport industry. We wish to make it clear, however, that the proposed NPRM 74-14 will in no way rectify this situation.

24 January 1975

Mr. Charles R. Foster
Director, Office of Environmental Quality
Federal Aviation Administration, AEQ-1
800 Independence Ave., S.W.
Washington, D. C. 20591

Dear Chuck:

We have reviewed the Draft Environmental Impact Statement for Civil Airplane Fleet Noise Requirements dated December 1975 and wish to take this opportunity to comment on it.

The results of our assessment of the potential benefits of a SAM retrofit have indicated much smaller benefits than indicated in this draft EIS. The greatest difficulty we have with the report is the assumption throughout that if an airport neighbor's exposure goes from above NEF 30 (or 40) to below NEF 30 (or 40), he will experience a meaningful reduction in noise and will no longer be impacted by noise.

Figures 7, 8 and 12 of Appendix C of the EIS contain the only data in which the benefits of the SAM retrofit are isolated. Figure 7 indicates that SAM treatment of the JT3D and JT8D powered aircraft by 1978 would result in a 25% reduction in the population exposed to NEF 30 or above. Earlier reports on this study have shown that for NEF 30 the reduction in population exposed and reduction in contour area are comparable. It has been generally accepted that aircraft noise contours are cut roughly in half by each 4 dB reduction in noise. Thus a 25% reduction is roughly the equivalent of a reduction of 2 dB for the people exposed to an NEF of 30. There is a tendency to consider that this 25% of the exposed population will go from an impacted condition to a non-impacted condition, and this is a quarter of the way toward a solution to the noise problem. This is not a proper interpretation of this result. We would not expect that an average reduction of 2 dB would have any significant effect on those people exposed to NEF 30. It seems that on average the people exposed to NEF 31 before retrofit would be exposed to NEF 29 after retrofit, and certainly 2 dB is difficult to detect even under laboratory conditions.

The reduction in population of those exposed to NEF 40 is between 45 and 50%. Again the impression that the problem is half solved, but in actuality people in that general category would probably experience a reduction of about 4 dB. Again a reduction from NEF 42 to NEF 38 could hardly be expected to result in a very meaningful improvement.

This same reasoning could be applied to the data in Figure 8, and the indication is that the improvement is even less both before and after 1978. Figure 12 breaks this information out by airport for the reduction in population exposed to NEF 30 or above. Our analysis would show the equivalent reduction is only 1 to 4 dB for any given airport with most being 2 dB or less.

Based on this analysis we believe a reassessment of the results of this study will provide very convincing evidence that a SAM retrofit program will not provide meaningful benefits for most airport neighbors.

We have found contours of equal noise reduction resulting from a noise reduction option to be a very informative tool in the evaluation of airport noise. It would appear that the necessary data are available in the DOT's Twenty Three Airport Study to develop contours of equal reduction in NEF, which would result from the various options. We believe this would provide a much clearer picture of the benefits that might be expected from a SAM retrofit program. We urge the FAA to consider an examination of such contours.

We also have considerable concern about some of the input data used in the study. We have attached a copy of our response to NPRM 74-14 which provides data which we believe more nearly reflects the kinds of reductions that might be expected from the application of SAM suppression to DC-8 and DC-9 aircraft. This document also provides additional information on our assessment of the SAM retrofit option.

Considering the enormous costs that would be associated with a SAM retrofit program and all the implications of such a program, we believe the FAA should explore every reasonable avenue to help in understanding the community benefits of such a program before establishing any regulation. We would be pleased to cooperate with the FAA in such an endeavor.

Sincerely,

A. L. McPike

A. L. McPike
Director
Industry Association Activities

ALM:mlg

DOUGLAS AIRCRAFT COMPANY

3855 Lakewood Boulevard Long Beach, California 90846

26 June 1974
C1-CMF-80

CHARLES M. FORSYTH
EXECUTIVE VICE PRESIDENT

Federal Aviation Administration
Office of the General Counsel
800 Independence Avenue, S.W.
Washington, D.C. 20590

Attention: Rules Docket CFR-91

Subject: Civil Aircraft Fleet Noise (FNL) Requirements
Notice of Proposed Rulemaking

Reference: Docket No. 13582; Notice No. 74-14

Gentlemen:

The Douglas Aircraft Company has studied NPRM 74-14 - Civil Aircraft Fleet Noise Requirements and is pleased to have the opportunity to submit the following comments for your consideration.

Our analysis of the NPRM and of the overall question of a sound absorbent material (SAM) retrofit program has led us to the following conclusions:

1. The benefits of conducting such a program to reduce the whine without also reducing the jet roar of the JT3D and JT8D engine powered aircraft in the fleet would be minimal and therefore disappointing to most airport neighbors seeking meaningful relief.

2. While the SAM technology has been demonstrated, SAM retrofit kits for all JT3D and JT8D powered aircraft are not available. Considering the lack of production design and tooling for JT3D kits, long material lead times and production capacity limitations, a SAM retrofit program if undertaken could not be completed until early in the next decade.

3. While we are uncertain of the intended applicability of the deletion of the tradeoff provisions of FAR Part 36, we find that deletion of these provisions is indefensible for any application and urge the FAA to reconsider any such action.

4. The FAA should develop an acceptable and approved means of paying for any retrofit program before establishing a requirement for it.

These conclusions are supported by the more detailed comments included in Attachment 1. Additionally, the conclusion concerning the minimal benefits of the proposed program is further supported by the extensive analysis provided for your information in Attachment 2. This analysis includes some new methodology which permits a specific estimation of the noise reduction that would be expected by any airport community from installing a SAM noise suppressor on an aircraft. As an example, it indicates that the residents of Georgetown near Washington National Airport would experience reductions of only 1 dBA resulting from the DC-9 SAM treatment if outdoors, even less if indoors. We believe this analysis method is the first to offer a realistic assessment of the benefits of SAM suppression.

Based on the above conclusions we recommend that the FAA cancel NPRM 74-14 and pursue more meaningful approaches to the airport community noise problem. We will be happy to cooperate with the FAA in this pursuit.

On the other hand, if the FAA continues to pursue a SAM retrofit program, we would urge careful consideration of the information supplied herein with respect to costs, schedules and the specific requirement. If there is to be a SAM retrofit program, it should be accomplished on an international basis to international noise standards on a realistic schedule and with some approved approach to paying for it.

In closing we would like to point out that our attitude toward a SAM noise retrofit program should not be construed to imply that we fail to take the airport neighborhood noise problem seriously. On the contrary we view this problem as a very serious threat to the future of our air transportation system. It is for this reason that we are apprehensive about a program which would direct our resources toward technology which in our opinion would not offer significant relief for most airport neighbors.

Sincerely,

Charles M. Forsyth

Charles M. Forsyth

COMMENTS ON NPRM 74-14
CIVIL AIRCRAFT FLEET NOISE REQUIREMENTS

1. The Benefits - The NPRM specifically requested comments on the overall environmental aspects of this proposal. Basically the NPRM is proposing a SAM (Sound Absorbent Material) nacelle retrofit program for the current fleet of low bypass ratio turbofan powered aircraft. This would consist of applying SAM technology to these aircraft to bring the turbomachinery noise of their engines roughly to the same level as their jet exhaust noise. It would provide no reduction in the jet exhaust noise of these engines. Our analyses indicate that while application of this technology to DC-9's and DC-8's would provide maximum reductions of from 4 to 10 dB for a few people under certain conditions, most neighbors would experience levels which are much smaller. In fact many, perhaps most, of the airport neighbors who are annoyed by aircraft noise would experience no detectable change in that noise as a result of such a program. These analyses are described in some detail in Attachment 2. Our conclusion is that the proposed program would have only a small impact on the overall airport community noise environment.

2. The Schedules - The NPRM would require that all aircraft in the fleet be in compliance with the proposed requirement by mid-1978 and that half of an operator's fleet of a given aircraft type be in compliance by mid-1976. Assuming for the moment that the DC-9's would require a SAM retrofit kit installation to comply with the proposal, meeting the intermediate date of mid-1976 would not be possible. As paced by material supply limitations, the DC-9 nacelle treatment as a retrofit kit is currently available 22 months from date of order. Assuming further that the earliest a rule might be promulgated would be at the end of this year and that orders for kits were placed immediately thereafter, the first kit would not be available until late in 1976.

A retrofit of the complete world fleet of DC-9's would of course involve the development and installation of up to 700 ship sets of SAM kits. At a rate of 15 ship sets per month, this would require up to about 4 years after the first kit became available before retrofit could be completed. This of course assumes that the airlines could install them as fast as they became available. This would indicate a date of late 1980 for completion of a retrofit on the DC-9.

The time from go ahead to the first kit for the DC-8 is 28 to 36 months depending on the model. Again assuming a go ahead at the end of the year, the first kits would not be available until 1977. At a rate of one aircraft kit per week each for the long duct and short duct pod DC-8's, it would be about 1981 before the program could be completed.

We would suggest that if there is to be a nacelle retrofit program, its scheduling must be modified to reflect this information.

3. Applicability and the Specific Requirements of the Proposal - In general the NPRM appears to be addressing the subject of a nacelle retrofit program for the JT3D and JT8D powered aircraft. However, in paragraph 91.303 of proposed subpart E, it appears that the tradeoff provisions of Part 36 will not be permitted. As stated, it would appear that all aircraft must meet Part 36 without the possibility of using tradeoffs after mid-1978. We are not certain if it was the FAA's intent to apply this to all aircraft, or just those segments of the fleet which do not comply with Part 36. However, in any event we must strongly object to the whole idea of deleting tradeoff provisions. There are aircraft of both the narrow bodied and wide bodied type, both in production and previously delivered, which are in compliance with Part 36 but which do require the use of the tradeoff provisions. To suddenly delete the tradeoff provisions for all aircraft would result in utter chaos.

On the other hand, to suggest that aircraft designed more than ten years ago must suddenly meet requirements which are more stringent than those for newer aircraft is completely unsupportable. We understand that the FAA's intent may be to delete the tradeoff provisions only for those aircraft/configurations which were not certified to Part 36 prior to the date of the notice. If true, this would constitute an unfair and discriminatory provision unprecedented in aircraft regulatory history.

We thus urge the FAA to drop any consideration of deleting the tradeoff provision of Part 36. In fact, we would urge the FAA to go even further. If there is to be a retrofit rule, it would be sensible only if the entire world fleet were retrofitted. Otherwise for some aircraft types the kit cost per airplane would be much higher. Thus, if there is to be a rule, it should be done on an international basis to international standards. This would mean that for any retrofit the requirement should be to Annex 16. The difference in perceived noise between aircraft meeting Annex 16 and meeting Part 36 could hardly be detectable. However, the cost differences between retrofitting to these two requirements could be enormous as illustrated by the attached data. We therefore urge the FAA to adopt ICAO Annex 16 as a requirement if it pursues any SAM retrofit program.

4. Costs - The firm price of the SAM kit for the DC-9 is $140,000 including Pratt and Whitney treated fan ducts. This price does not include installation costs; spares costs would have to be added also. The price is for 1974 orders and is subject to escalation. The kit has been designed, tested and certified.

The situation for the DC-8 is quite different. Because there are no kits in existence for this aircraft and because it is impossible to be sure what, if any, requirement will eventually be established for such kits, costs can only be roughly estimated. These estimated kit costs for the DC-8 vary from $450,000 to $900,000 depending on the requirement and on the type fan discharge duct included on the JT3D engine (long or short duct). These estimates of course assume that the kit development costs can be spread over a significant number of aircraft. If it were necessary to spread these development costs over a limited portion of the fleet, the costs per aircraft could climb much higher. Cost estimates for a number of specific kits for the various models of the DC-8 and DC-9 are discussed below in the section called "Possible DC-8 and DC-9 Nacelle Retrofit Kits". It should be clearly understood, however, that these costs are supplied purely for general planning purposes and are not commitments on either price or availability for the DC-8.

The data we as manufacturers can supply of course deals with only one portion of the costs of any retrofit program. While the costs of the kits for a fleet retrofit program would probably exceed one billion dollars, the additional costs associated with installation, spares financing, maintenance and increased operating costs would probably amount to even more than that. We would urge the FAA to develop an acceptable means for paying for such a program before establishing a requirement for it.

5. Possible Nacelle Retrofit Kits for DC-8 and DC-9 Aircraft - Attached is a set of charts which provide nacelle retrofit kit data for the several versions of the DC-8 and DC-9 aircraft. On pages 1 through 3 there is a listing of the various models of the DC-8 and -9

for which a kit is available (DC-9) or under consideration (DC-8). In each case the specific engine is listed below the model number. This is followed by a column which provides the MTOGW (Maximum Takeoff Gross Weight) and MLW (Maximum Landing Weight) of the aircraft, which except as noted are the maximum design weights for the aircraft. The next column indicates the landing flap setting assumed. In the last three columns are listed a particular SAM suppressor kit which when installed on the airplane should bring it into compliance with the noted possible requirement. Part 36 with the tradeoff provisions, Part 36 without the tradeoff provisions and Annex 16 are the three possible requirements. The treatment code is quite simple. TJP refers to turbojet pod and the -1 is a sequence of devices considered. SDP refers to the short duct pod, which is on all JT3D powered DC-8 Series 50 and 61 aircraft. SDP-5 and SDP-7 are the two configurations currently under consideration for this pod. LD refers to the long duct pod which is used on DC-8-62 and -63 series with JT3D engines. The LD-2A and LD-2C are the two configurations currently under consideration for the long duct pod.

The remaining pages provide for each suppression kit a sketch showing where the treatment is added and a table showing the noise levels required and predicted with that kit at the noted weights. Following each table there are estimates of the change in specific range, change in airplane weight, kit costs, kit availability and retrofit down time associated with installation of the kit. In the case of the DC-9, information is presented for the hardwall case because with it almost all DC-9's are in compliance with both Part 36 and Annex 16.

DC-8 / DC-9 NACELLE RETROFIT KITS

JULY 19 - 1974

The enclosed information is furnished for planning purposes only. It is based on the best available nominal data but should not be construed as a guarantee nor as a commitment to manufacture or deliver the subject treatment. Exceptions are noted for aircraft FAA certified at the specified noise levels.

DC-8/DC-9 NACELLE RETROFIT
KIT REQUIREMENTS

AIRPLANE	MTOGW/MLW (KLBS)	FLAPS	TREATMENT REQUIRED TO MEET (FAR PART 36) WITH TRADE	(FAR PART 36) WITHOUT TRADE	(ANNEX 16) WITH TRADE
*DC8-20/30 (JT4A-9/12)	*272/*180	50°	TJP-1 (Pg. 5)	TJP-1 (Pg. 5)	TJP-1 (Pg. 5)
*DC8-20/30 (JT4A-9/12)	*270/199.5	50°	TJP-1 (Pg. 5)	Will not comply	TJP-1 (Pg. 5)
DC8-51 (JT3D-3B)	286/199.5	50°	SDP-5 (Pg. 8)	SDP-7 (Pg. 10)	SDP-5 (Pg. 8)
DC8-51 (JT3D-1)	286/199.5	50°	SDP-5 (Pg. 8)	SDP-7 (Pg. 10)	SDP-5 (Pg. 8)
*DC8-51 (JT3D-3B)	286/*192	50°	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)
DC8-52 (JT3D-3B)	305/207	50°	SDP-5 (Pg. 8)	SDP-7 (Pg. 10)	SDP-5 (Pg. 8)
*DC8-52 (JT3D-3B)	305/*195	50°	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)
*DC8-52 (JT3D-3B)	305/207	*35°	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)
DC8-53 (JT3D-3B)	315/207	50°	SDP-5 (Pg. 8)	SDP-7 (Pg. 10)	SDP-5 (Pg. 8)
*DC8-53 (JT3D-3B)	315/*197	50°	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)

*Reduced Operating Weight and/or Flap Alternatives

DC-8/DC-9 NACELLE RETROFIT
KIT REQUIREMENTS

AIRPLANE	MTOGW/MLW (KLBS)	FLAPS	(FAR PART 36) WITH TRADE	(FAR PART 36) WITHOUT TRADE	(ANNEX 16) WITH TRADE
DC8-54 (JT3D-3B)	315/240	50°	SDP-5 (Pg. 8)	SDP-7 (Pg. 10)	SDP-5 (Pg. 8)
*DC8-54 (JT3D-3B)	315/240	*35°	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)	SDP-5 (Pg. 8)
DC8-55/61 (JT3D-3B)	325/240	50°	SDP-5 (Pg. 9)	SDP-7 (Pg. 10)	SDP-5 (Pg. 9)
*DC8-55/61 (JT3D-3B)	*320/240	*35°	SDP-5 (Pg. 9)	SDP-5 (Pg. 9)	SDP-5 (Pg. 9)
*DC8-61F (JT3D-3B)	328/258	*35°	SDP-5 (Pg. 9)	SDP-7 (Pg. 10)	SDP-5 (Pg. 9)
*DC8-61F (JT3D-3B)	*320/258	*35°	SDP-5 (Pg. 9)	SDP-5 (Pg. 9)	SDP-5 (Pg. 9)
DC8-62 (JT3D-7)	335/240	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
DC8-62 (JT3D-3B)	335/240	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
DC8-62 (JT3D-7)	350/240	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
DC8-62 (JT3D-7)	335/250	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
*DC8-62 (JT3D-7)	335/250	*35°	LD-2A (Pg. 12)	LD-2A (Pg. 12)	LD-2A (Pg. 12)

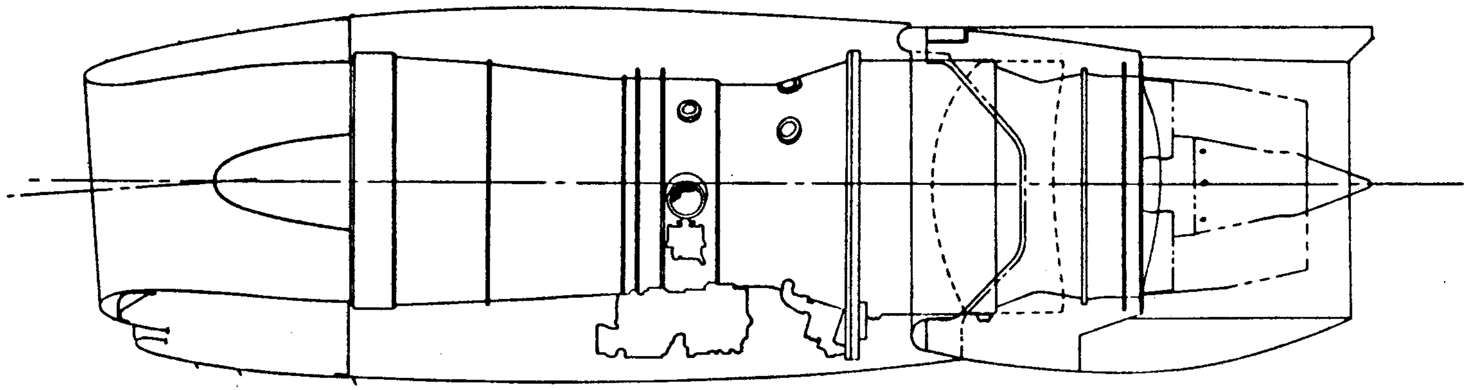
*Reduced Operating Weight and/or Flap Alternatives

DC-8/DC-9 NACELLE RETROFIT
KIT REQUIREMENTS

AIRPLANE	MTOGW/MLW (KLBS)	FLAPS	(FAR PART 36) WITH TRADE	(FAR PART 36) WITHOUT TRADE	(ANNEX 16) WITH TRADE
DC8-63 (JT3D-7)	350/245	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
DC8-63 (JT3D-7)	355/258	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
DC8-63 (JT3D-7)	355/275	50°	LD-2A (Pg. 12)	LD-2C (Pg. 13)	LD-2A (Pg. 12)
DC9-14 & -15 (JT8D-7)	90.7/81.7	50°	None (Pg. 14)	None (Pg. 14)	None (Pg. 14)
DC9-20 (JT8D-9)	98/93.4	50°	None (Pg. 14)	None (Pg. 14)	None (Pg. 14)
DC9-20 (JT8D-11)	98/93.4	50°	None (Pg. 14)	None (Pg. 14)	None (Pg. 14)
DC9-31 (JT8D-7)	105/98.1	50°	None (Pg. 14)	P-36 (Pg. 15)	None (Pg. 14)
DC9-31 (JT8D-9)	103/98.1	50°	None (Pg. 14)	P-36 (Pg. 15)	None (Pg. 14)
DC9-32 (JT8D-7)	108/99	50°	None (Pg. 14)	P-36 (Pg. 15)	None (Pg. 14)
DC9-32 (JT8D-9	108/99	50°	None (pg. 14)	P-36 (Pg. 15)	None (Pg. 14)
DC9-33, -41 (JT8D-9)	114/102	50°	P-36 (Pg. 15)	P-36 + re-engine to JT8D-15 (Pg. 15)	None (Pg. 14
DC9-33, -41 (JT8D-11)	114/102	50°	P-36 (Pg. 15)	P-36 + re-engine to JT8D-15 (Pg. 15)	None (Pg. 14)
DC9-33, -41 (JT8D-15)	114/102	50°	None (Pg. 14)	P-36 (Pg.15)	None (Pg. 14)

*Reduced Operating Weight and/or Flap Alternatives

DC-8-20/30 JT4A-9/12
NO ACOUSTIC TREATMENT



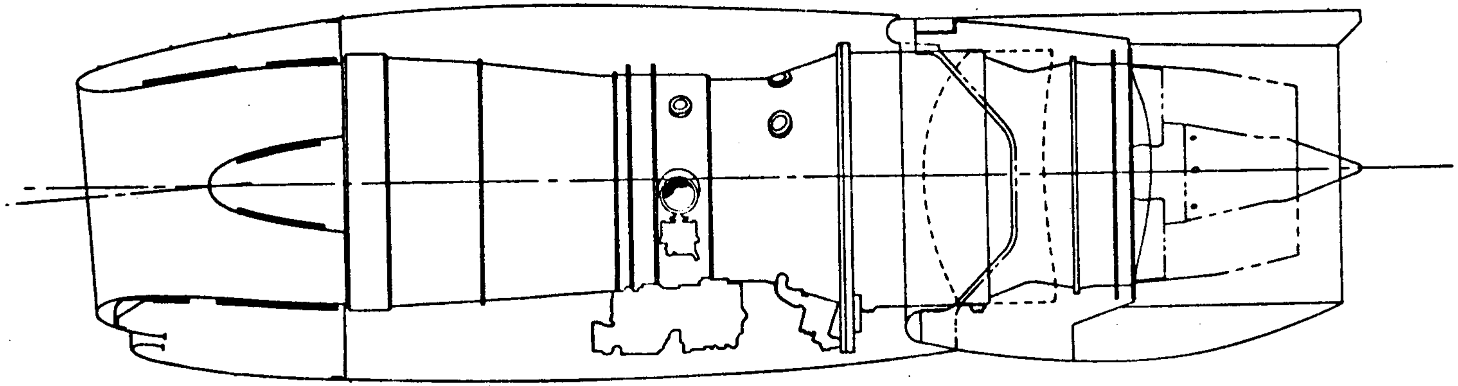
NOISE LEVELS

(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
-20/30 (JT4A-9/12)	*272/*180	(50°)	102.3/113	102.3/102	105.7/105	105.7/111	105.7/110
-20/30 (JT4A-9/12)	*279/199.5	(50°)	102.2/113	102.2/102	105.7/105	105.7/111	105.7/110

*Reduced Operating Weight and/or Flap Alternatives

TJP-1 TREATMENT FOR
DC-8-20 AND DC-8-30



NOISE LEVELS
(Requirement/Predicted)

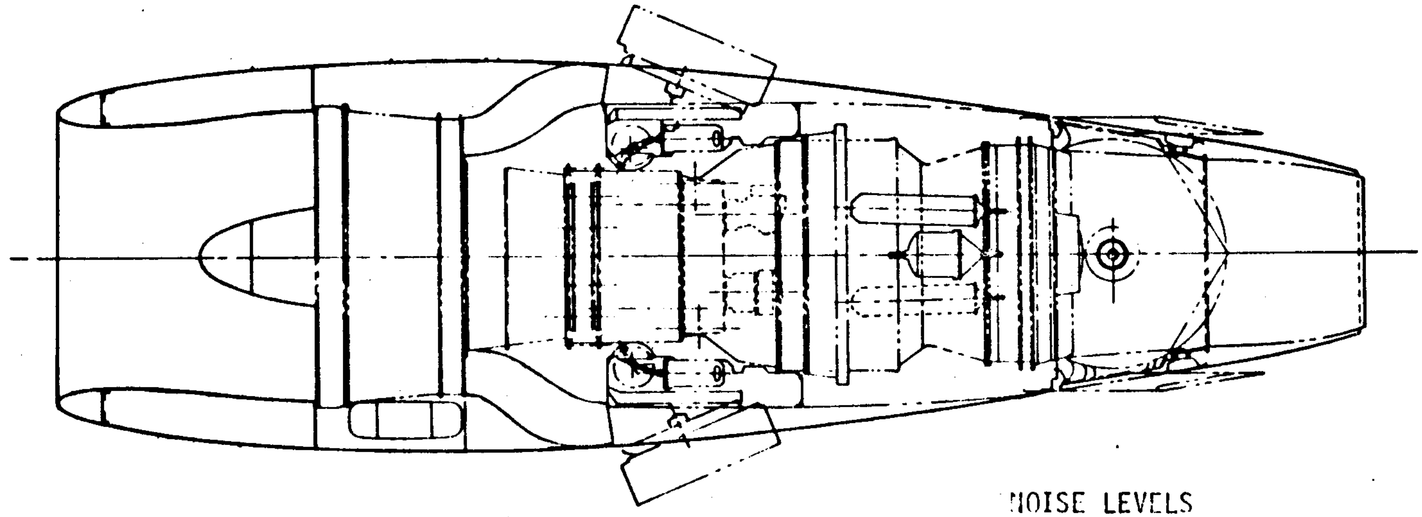
MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CR (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
-20/30 (JT4A-9/12)	*272/*180	(50°)	102.3/113	102.3/102	105.7/105	105.7/106	105.7/105
-20/30 (JT4A-9/12)	*270/199.5	(50°)	102.2/113	102.2/102	105.7/105	104.7/106	105.7/105

DC8-20 and -30 at certified MTOGW and MLW will not meet FAR Part 36 or ICAO Annex 16

ΔSPECIFIC RANGE (%)	ΔWT. (AIRPLANE)	SHIP SET KIT COST $	AVAILABILITY	RETROFIT DOWN TIME
0	60 lbs.	**	**	**

*Reduced Operating Weight and/or Flap Alternatives

DC-8-51/61 JT3D-3B (EXCEPT AS NOTED)
NO ACOUSTIC TREATMENT

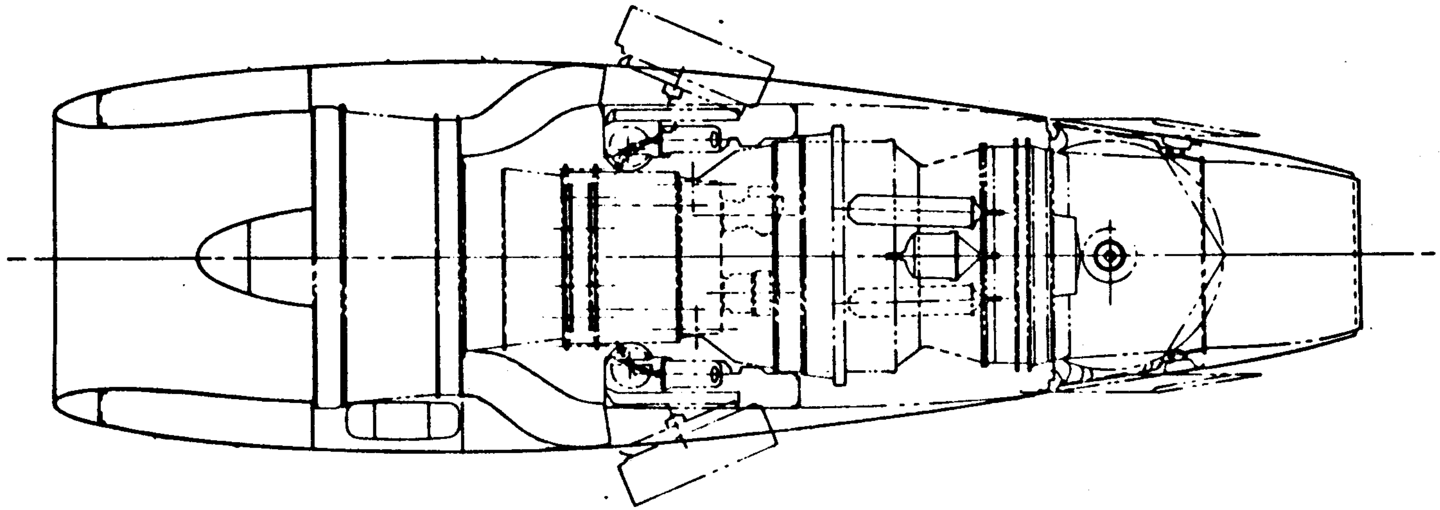


NOISE LEVELS
(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CR (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
**51	286/199.5	(50°)	102.7/107	102.7/106	105.9/102	105.9/111	105.9/110
51	286/199.5	(50°)	102.7/107	102.7/102	105.9/102	105.9/111	105.9/110
*51	286/*192	(50°)	102.7/107	102.7/102	105.9/102	105.9/111	105.9/110
52	305/207	(50°)	103.1/109	103.1/105	106/102	106/111	106/110
*52	305/*195	(50°)	103.1/109	103.1/105	106/102	106/111	106/110
*52	305/207	(35°)*	103.1/109	103.1/105	106/102	106/109	106/103
53	315/207	(50°)	103.4/110	103.4/107	106.1/101	106.1/111	106.1/110
*53	315/*197	(50°)	103.4/110	103.4/107	106.1/101	106.1/111	106.1/110
*53	315/207	(35°)*	103.4/110	103.4/107	106.1/101	106.1/109	106.1/108
54	315/240	(50°)	103.4/110	103.4/107	106.1/101	106.1/112	106.1/112
*54	315/240	(35°)*	103.4/110	103.4/107	106.1/101	106.1/110	106.1/109

*Reduced Operating Weight and/or Flap Alternatives
**JT3[illegible] Engine

DC-8-51/61 JT3D-3B (EXCEPT AS NOTED)
NO ACOUSTIC TREATMENT



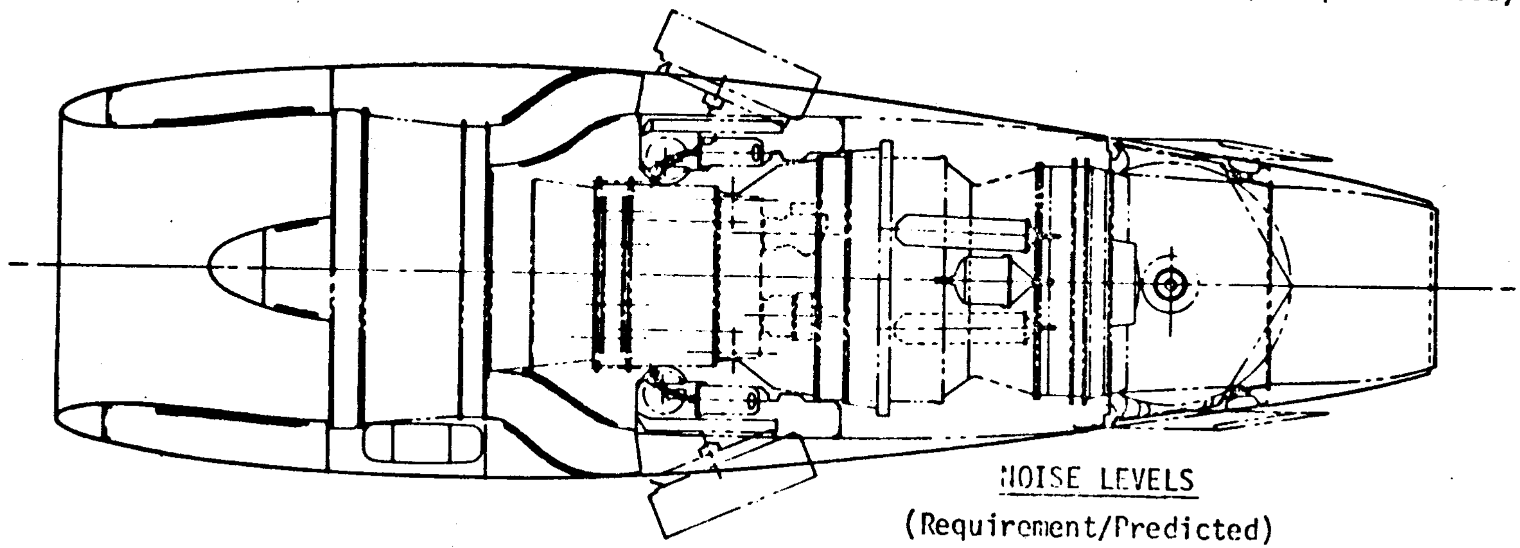
NOISE LEVELS

(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
55/61	325/240	(50°)	103.6/110	103.6/108	106.2/101	106.2/112	106.2/112
*55/61	*320/*240	(35°)	103.5/110	103.5/107	106.2/101	106.2/110	106.2/109
*61F	328/258	(35°)	103.6/111	103.6/109	106.3/101	106.3/110	106.3/110
*61F	*320/258	(35°)*	103.5/110	103.5/107	106.3/101	106.3/110	106.3/110

*Reduced Operating Weight and/or Flap Alternatives

JT3D-3B Engine (except as noted)



NOISE LEVELS

(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB	SL	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
**51	286/199.5	(50°)	102.7/107	102.7/101	105.9/102	105.9/106	105.9/106
51	286/199.5	(50°)	102.7/107	102.7/98	105.9/102	105.9/106	105.9/106
*51	286/*192	(50°)	102.7/107	102.7/98	105.9/102	105.9/106	105.9/105
52	305/207	(50°)	103.1/108	103.1/101	106/102	106/106	106/106
*52	305/*195	(50°)	103.1/108	103.1/101	106/102	106/106	106/105
*52	305/207	(35°)*	103.1/108	103.1/101	106/102	106/104	106/103
53	315/207	(50°)	103.4/109	103.4/102	106.1/101	106.1/106	106.1/106
*53	315/*197	(50°)	103.4/109	103.4/102	106.1/101	106.1/106	106.1/105
*53	315/207	(35°)*	103.4/109	103.4/102	106.1/101	106.1/104	106.1/103
54	315/240	(50°)	103.4/109	103.4/102	106.1/101	106.1/108	106.1/107
*54	315/240	(35°)*	103.4/109	103.4/102	106.1/101	106.1/105	106.1/105

*Reduced Operating Weight and/or Flap Alternatives

**JT3D-1 Engine

Cont. Pg. 9

SDP-5 TREATMENT FOR DC8-50 AND DC8-61

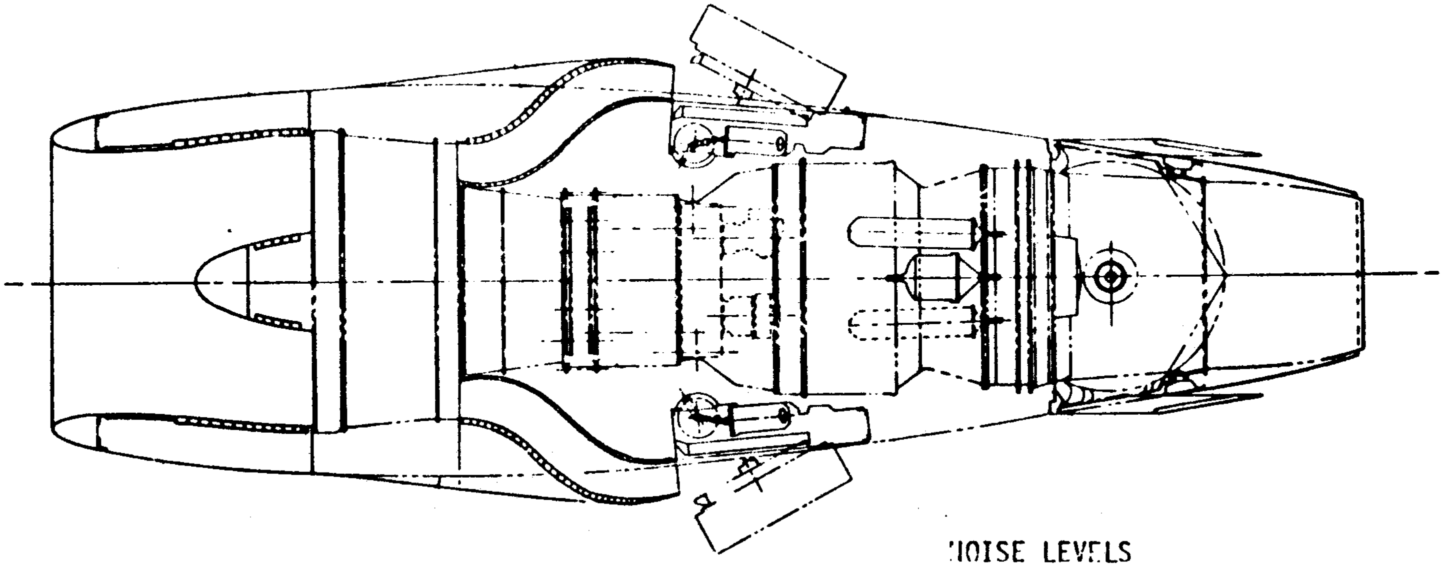
(continued)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB	SL	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
55/61	325/240	(50°)	103.6/109	103.6/104	106.2/101	106.2/108	106.2/107
*55/61	*320/*240	(35°)	103.5/109	103.5/103	106.2/101	106.2/105	106.2/105
*61F	328/258	(35°)*	103.6/110	103.6/104	106.3/101	106.3/106	106.3/105
*61F	*320/258	(35°)*	103.5/109	103.5/103	106.2/101	106.2/106	106.2/105

ΔSPECIFIC RANGE (%)	ΔWT. (AIRPLANE)	SHIP SET KIT COST $	AVAILABILITY	RETROFIT DOWN TIME	TOTAL REWORK PER AIRCRAFT-MN/HRS
0	93 lbs.	$450,000	ATP + 28 months	24 hours elapsed	1350

*Reduced Operating Weight and/or Flap Alternatives

SDP-7 TREATMENT FOR DC-8-50 AND DC-8-61

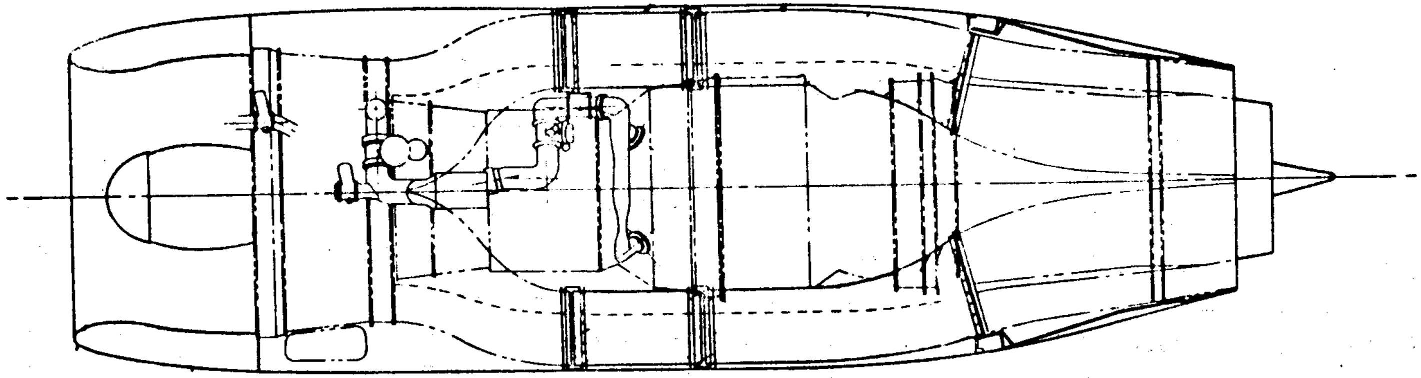


MODEL	OPERATING WEIGHTS MTOLGW/MLW KLBS	(FLAPS)	NOISE LEVELS (Requirement/Predicted) TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB	SL	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
-51 (JT3D-1)	286/199.5	(50°)	102.7/107	102.7/100	105.9/102	105.9/105	105.9/104
-50/61 (JT3D-3D)	325/240	(50°)	103.6/109	103.6/103	106.2/101	106.2/106	106.2/106
-61F (JT3D-3D)	328/258	(35°)*	103.6/110	103.6/103	107.3/101	106.3/104	106.3/104

SPECIFIC RANGE (%)	WT. (AIRPLANE)	SHIP SET KIT COST $	AVAILABILITY	RETROFIT DOWN TIME	TOTAL REWORK PER AIRCRAFT - MN/HRS
+1	449 lbs.	$900,000	ATP + 30 months	72 hours elapsed	1880

*Reduced Operating Weight and/or Flap Alternatives

DC-8-62/63 JT3D-7 (EXCEPT AS NOTED)
NO ACOUSTIC TREATMENT



NOISE LEVELS

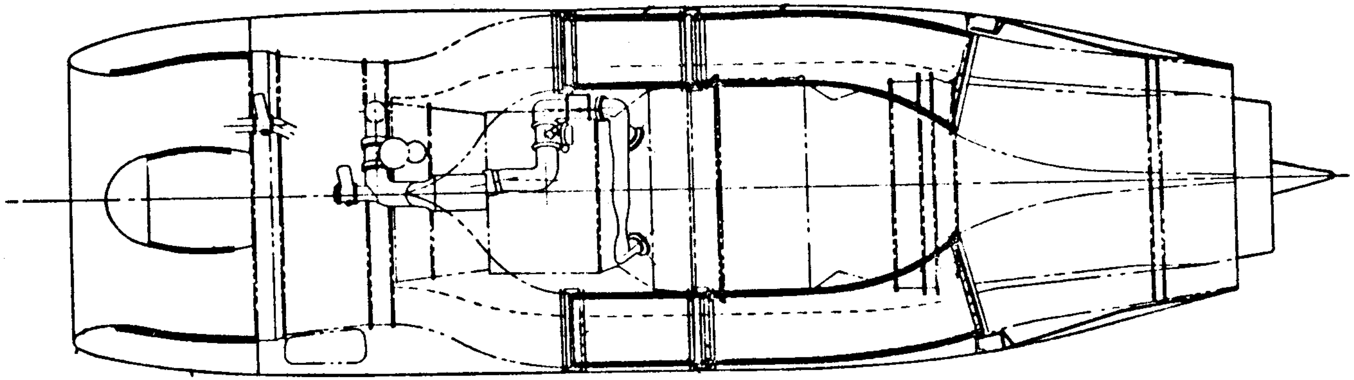
(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
62	**335/240	(50°)	103.8/111	103.8/110	106.3/100	106.3/113	106.3/113
	335/240	(50°)	103.8/110	103.8/109	106.3/100	106.3/113	106.3/113
	350/240	(50°)	104.1/112	104.1/111	106.4/100	106.4/113	106.4/113
	335/250	(50°)	103.8/110	103.8/109	106.3/100	106.3/114	106.3/113
	335/250	(35°)	103.8/110	103.8/109	106.3/100	106.3/112	106.3/112
63	350/245	(50°)	104.1/112	104.1/111	106.4/100	106.4/114	106.4/113
	355/258	(50°)	104.2/112	104.2/112	106.5/100	106.5/114	106.5/113
	355/275	(50°)	104.2/112	104.2/112	106.5/100	106.5/114	106.5/113

*Reduced Operating Weight and/or Flap Alternatives
**JT3D-3B Engine

LD-2A TREATMENT FOR
DC-8-62 AND DC-8-63

JT3D-7 Engine (except as noted)



NOISE LEVELS

(Requirement/Predicted)

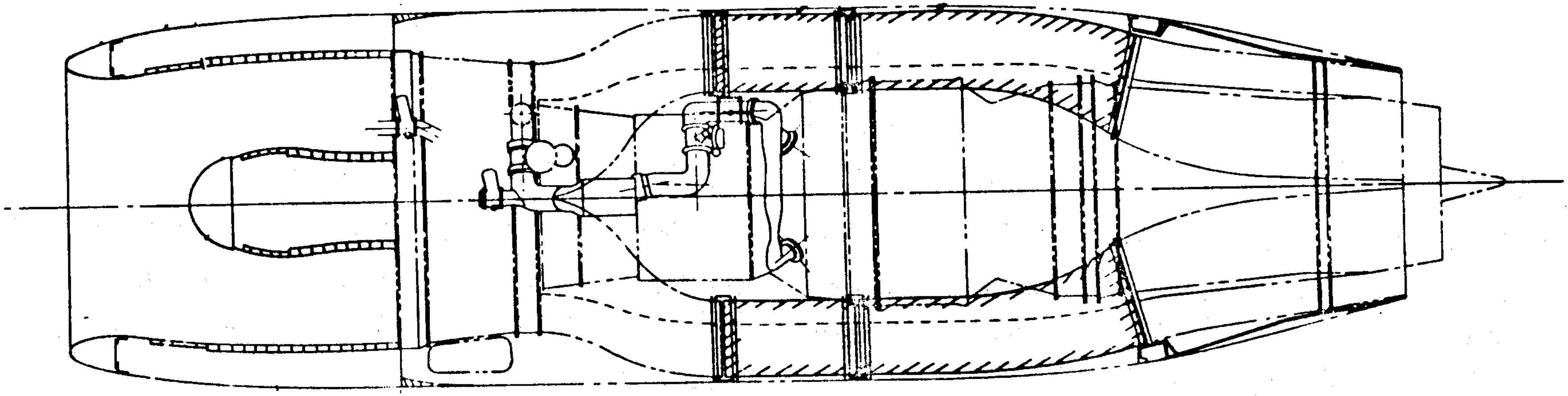
MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
62	**335/240	(50°)	103.8/110	103.8/105	106.3/97	106.3/107	106.3/107
	335/240	(50°)	103.8/108	103.8/104	106.3/97	106.3/107	106.3/107
	350/240	(50°)	104.1/109	104.1/105	106.4/97	106.4/107	106.4/107
	335/250	(50°)	103.8/108	103.8/104	106.3/97	106.3/107	106.3/107
	335/250	(35°)*	103.8/108	103.8/104	106.3/97	106.3/106	106.3/105
63	350/245	(50°)	104.1/109	104.1/105	106.4/97	106.4/107	106.4/107
	355/258	(50°)	104.2/109	104.2/106	106.5/97	106.5/107	106.5/107
	355/275	(50°)	104.2/100	104.2/106	106.5/97	106.5/108	106.5/107

SPECIFIC RANGE (%)	Δ WT. (AIRPLANE)	SHIP SET KIT COST $	AVAILABILITY	RETROFIT DOWN TIME	TOTAL REWORK PER AIRCRAFT - MM
0	304 lbs.	$600,000	ATP + 36 months	24 hours elapsed	120

*Reduced Operating Weight and/or Flap Alernatives

**JT3D-3B Engine

LD-2C TREATMENT FOR DC-8-62 AND DC-8-63



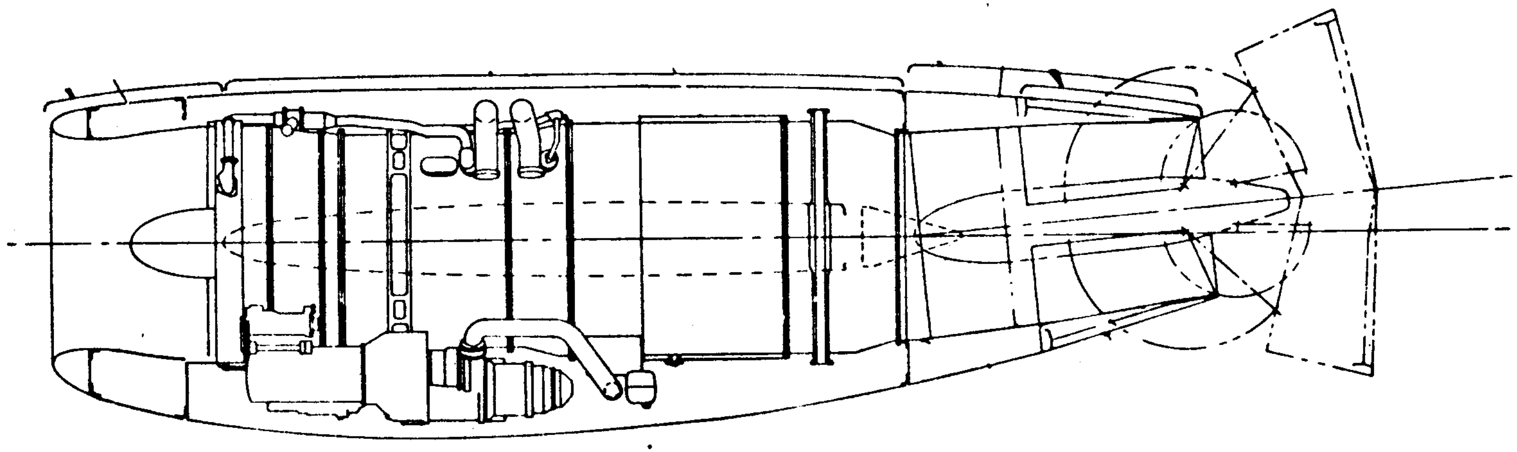
NOISE LEVELS

(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS	(FLAPS)	TO (FAR PART 36 & ICAO ANNEX 16)	TO/CB (FAR PART 36 & ICAO ANNEX 16)	SL (FAR PART 36 & ICAO ANNEX 16)	APPROACH (FAR PART 36)	APPROACH (ICAO ANNEX 16)
62/63 (JT3D-7)	355/275	(50°)	104.2/109	104.2/104	106.5/97	106.5/105	106.5/105
62 (JT3D-3B)	335/240	(50°)	103.8/110	103.8/104	106.3/97	106.3/105	106.3/104

ΔSPECIFIC RANGE (%)	ΔWT. (AIRPLANE)	SHIP SET KIT COST $	AVAILABILITY	RETROFIT DOWN TIME	PER AIRCRAFT - MH
0	916 lbs	$650,00	ATP + 36 months	24 hours elapsed	120

DC-9 MODELS WITHOUT RETROFIT TREATMENT

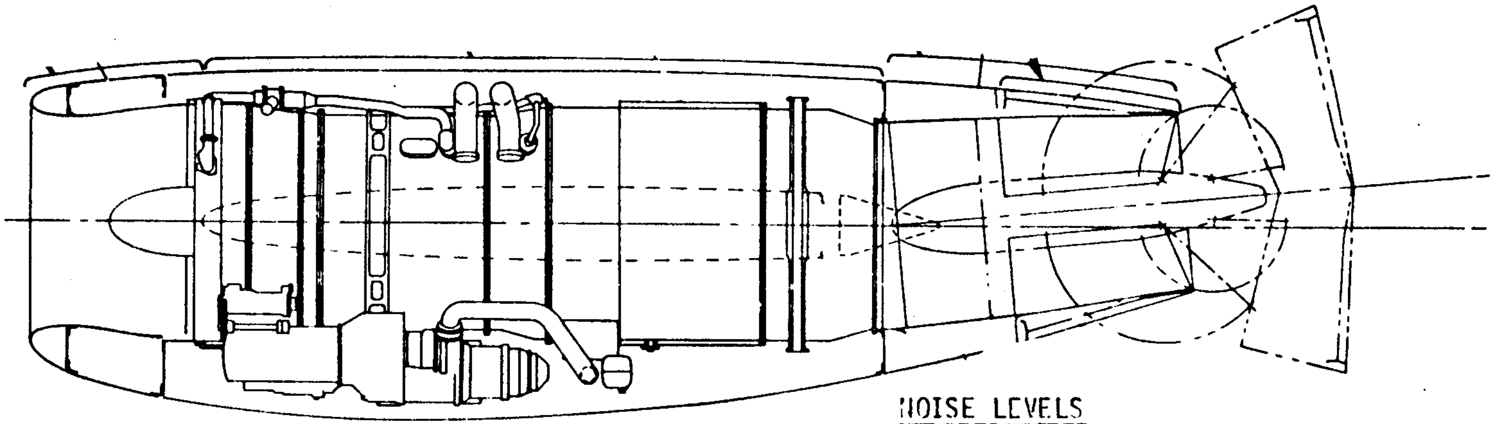


NOISE LEVELS

(Requirement/Predicted)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	FAR PART 36 TO	FAR PART 36 TO/CB	FAR PART 36 SL	FAR PART 36 APPROACH	ICAO ANNEX 16 TO	ICAO ANNEX 16 TO/CB	ICAO ANNEX 16 SL	ICAO ANNEX 16 APPROACH
-14 & -15 (JT8D-7)	90.7/81.7	94.4/93	94.4/92	102.5/99	102.5/101	94.4/93	94.4/95	102.5/96	102.5/100
-20 (JT8D-9)	98/93.4	94.9/99	94.9/93	102.8/100	102.8/103	94.9/99	94.9/87	102.8/97	102.8/102
-20 (JT8D-11)	98/93.4	94.9/100	94.9/93	102.8/98	102.8/103	94.9/100	94.9/96	102.8/103	102.8/102
-31 (JT8D-9)	103/98.1	95.3/100	95.3/96	102.9/100	102.9/103	95.3/100	95.3/89	102.9/97	102.9/102
-31 (JT8D-7)	105/98.1	95.4/101	95.4/95	103/98	103/101	95.4/101	95.4/89	103/95	103/101
-32 (JT8D-7)	108/99	95.6/101	95.6/97	103.1/98	103.1/101	95.6/101	95.6/90	103.1/95	103.1/101
-32 (JT8D-9)	108/99	95.6/102	95.6/97	103.1/100	103.1/103	95.6/102	95.6/90	103.1/97	103.1/102
-33, -41 (JT8D-9)	114/102	96/103	96/99	103.2/100	103.2/103	96/103	96/92	103.2/97	103.2/103
-33, -41 (JT8D-11)	114/102	96/102	96/99	103.2/101	103.2/103	96/102	96/92	103.2/98	103.2/103
-33, -41 (JT8D-15)	114/102	96/102	96/97	103.2/101	103.2/103	96/102	96/99	103.2/98	103.2/103

p-36 TREATMENT FOR
DC-9-31, -32, -33, -44
KCN 215



NOISE LEVELS

(Requirement/Predicted or FAA Certificated)

MODEL	OPERATING WEIGHTS MTOGW/MLW KLBS.	FAR PART 36 TO	FAR PART 36 TO/CB	FAR PART 36 SL	FAR PART 36 APPROACH	ICAO ANNEX 16 TO	ICAO ANNEX 16 TO/CB	ICAO ANNEX 16 SL	ICAO ANNEX 16 APPROACH
-31 (JT8D-9)	103/98.1	95.3/100	95.3/94	102.9/99	102.9/99	95.3/100	95.3/87	102.9/96	102.9/98
-31 (JT8D-7)	105/98.1	95.4/100	95.4/94	103/97	103/97	95.4/100	95.4/87	103/94	103/97
-32 (JT8D-7)	108/99	95.6/100	95.6/95.2*	103.1/97.3*	103.1/97.3*	95.6/100	95.6/88	103.1/94	103.1/97
-32 (JT8D-9)	108/99	95.6/102	95.6/95.6*	103.1/98.9*	103.1/99.1*	95.6/102	95.6/89	103.1/96	103.1/98
-33, -41 (JT8D-9)	114/102	96.0/102	96.0/97	103.2/99	103.2/99	96.0/102	96.0/90	103.2/96	103.2/99
-33, -41 (JT8D-11)	114/102	96.0/101	96.0/96.8*	103.2/99.9*	103.2/99.4*	96.0/101	96.0/90	103.2/97	103.2/99
-33, -41 (JT8D-15)	114/102	96.0/102	96.0/95.8*	103.2/100.5*	103.2/99.4*	96.0/102	96.0/88	103.2/97	103.2/99

ΔSPECIFIC RANGE (%)	ΔWEIGHT (AIRPLANE)	SHIP SET KIT COST $	AVAILABILITY	RETROFIT DOWN TIME	TOTAL REWORK PER AIRCRAFT - MH/HRS
0	330 lbs.	$99,774 DACO Kit +$43,500 P&WA "Hush Kit"	ATP + 22 months	8 Hrs. elapsed	932

*FAA Certificated

AN ASSESSMENT OF THE BENEFITS OF A NACELLE RETROFIT PROGRAM

Problems with Existing Assessment Methods

Quite a number of rating methods have been used to compare the community noises of different aircraft types, different operating conditions, and different kinds of noise suppressors. The two primary methods have consisted of establishing the difference in noise levels at the FAR Part 36 noise measurement locations, or establishing the difference in areas of some particular noise level contour.

Both these methods are highly questionable when it comes to evaluating the benefits of applying sound absorbent materials (SAM) to the existing fleet of JT3D and JT8D powered aircraft. The primary difficulty lies in the fact that the amount of noise reduction achieved by the SAM treatment varies considerably with engine type, with engine thrust, with distance from the engine and with other conditions which may influence the propagation path between the engine source and the receiver of the noise.

In the case of the Part 36 locations, the approach noise reduction is rated at only one point at a distance of 370 feet from the aircraft. For takeoff there are two points if the sideline is included as a part of takeoff, but the use of a major thrust reduction which is not currently a normal operating procedure certainly clouds the issue. There is a tendency to use only the takeoff point and for four engine aircraft, this involves an evaluation at a distance of only about 800 feet from the aircraft.

In the case of contour areas there are three major problems. One is the selection of the appropriate contour value. The projected benefits of suppression vary considerably with the value selected, and there is no value which is universally accepted as the most significant. The second problem is that no one can yet attach any particular significance to a given reduction in contour area. For example, a reduction in contour area of 50% sounds impressive, but it can be accomplished with a reduction of only 4 dB, which is not very impressive. Contour areas are highly sensitive to small changes in noise level, and caution must be exercised in attaching a particular significance to given reductions in contour areas. The third problem is, of course, the accuracy of the contour. Again because the contour areas are sensitive to small changes in noise level, gross inaccuracies in contour areas are not unusual. Our ability to predict noise levels at considerable distances from an aircraft and to account for wind and temperature gradients and terrain effects on propagation is quite limited. As a result there are no universally accepted means of developing contours.

The following sections evaluate the SAM treatment for DC-8 and DC-9 aircraft under new alternate evaluation systems. It is considered that in light of the difficulties of the more conventional systems, these evaluations will help substantially to put the benefits of the SAM treatment for JT3D and JT8D powered aircraft into a more proper perspective.

Contours of Equal Reduction in Noise Level

One proposed assessment method which should overcome at least most of the objections to existing methods is that of contours of equal reduction in noise level. This method would not be suitable for noise reduction features which achieve the same noise reduction for all frequencies but is especially suitable for something like the SAM suppression which reduces high frequency noise while leaving low frequency noise unchanged.

To develop such a contour for a given sound suppressor one could develop a series of contours for the unsuppressed case and for the suppressed case and then develop a new contour based on the differences between them. However, if the flight path of the aircraft is the same in both cases, there can be a much more direct approach. One need only know the flight path of the aircraft, the thrust setting for each segment of that flight path and the noise reduction achieved by the suppressor at each thrust setting as a function of the distance from the aircraft.

Figure 1 presents the noise reduction achieved by the P-36 sound suppressor for the JT8D powered DC-9 aircraft. The noise reductions are plotted as a function of distance from the aircraft for the three different thrust conditions which correspond to the takeoff, cutback and approach thrust of FAR Part 36. The noise reductions are plotted in terms of dB(A). The unit was selected primarily for reasons of simplicity. Extrapolation of EPNL's measured at one distance to various other distances is far more complex and uncertain than extrapolation of a simple unit such as PNL or dBA. In any event it is expected that using either PNL or EPNL would lead to the same general conclusions.

For all these thrusts the amount of noise reduction decreases as distance from the aircraft increases. This is of course because the high frequency noise which is attenuated by the suppressor is attenuated in any event by atmospheric absorption so that this type suppression does not affect the total noise at greater distances.

Noted on the curves are the three points which are representative of the three Part 36 evaluation points of approach, takeoff (with cutback) and sideline.

Even this plot provides a much greater insight into the benefits of the suppressor than the limited Part 36 values. However, utilizing these data to develop the contour provides an even more revealing analysis.

Figure 2 shows the contour of equal reduction in noise level for the P-36 suppressor for this airplane when flown under the FAR Part 36 conditions of weight, weather, operating procedures, etc. The aircraft is landing from the left and taking off toward the right. For approach Part 36 rates the suppressor only at the single point 1 nautical mile from touchdown as shown. However, only a small percentage of the airport neighbors would experience that reduction. Rather the airport neighbors would experience the reductions as shown in the Figure. For many airports of course a large part of the area experiencing the largest reduction in approach noise is a part of the clear zone or is at least not residential property. The amount of reduction decreases with increasing distance from the runway and of course decreases rapidly as one goes out towards the side from directly beneath the approach flight path of the aircraft.

As the aircraft begins its roll for takeoff there is a small reduction in noise. A reduction of 1 dBA could be expected out to a side distance of about 1000 feet. This narrows slightly as the aircraft gains altitude after liftoff. However, if the thrust is cut back at the 3 1/2 nautical mile point, the contour expands because the suppressor is more effective at the lower thrust. Actually the expansion starts well before the 3 1/2 nautical mile point. This takeoff procedure was developed to achieve a minimum noise level at the 3 1/2 mile point and requires that the thrust reduction be made more than 2000 feet prior to that point.

With this technique one can see that the reductions of the suppressor are too small to be detectable by most airport neighbors. However even this analysis is optimistic for the suppressor. Just as the atmosphere absorbs the high frequency noise more efficiently than low frequency noise so do the walls and roof of a house. For this reason the reductions resulting from a high frequency noise suppressor like SAM will be less indoors than outdoors. The average house attenuation from Society of Automotive Engineers Aerospace Information Report No. 1081 was applied to the suppressed and unsuppressed noise data for the DC-9 and the noise reduction was then recalculated for an indoor case. The results are plotted in Figure 3.

The results are similar to those of Figure 1 except that the reductions are even smaller. For the takeoff thrust case they have essentially dissappeared. The reduction is less than 2 dBA even for the approach case at 370 ft altitude. It is obvious from this curve that the typical indoor noise reductions achieved by the suppressor are too small to even be considered measurable. Figure 4 again presents the contours of equal noise reduction achieved by this suppressor but this time for the indoor case. There is a tiny island of 2 dBA reduction at the end of the runway and a narrow island of 1 dBA reduction extending out to 15,000 feet. There is nothing for takeoff.

All our studies show that the vast majority of the disturbances resulting from aircraft operational noise occur to people when they are in their homes. In light of this fact and of the data presented we find it extremely difficult to see that application of this suppressor would provide any meaningful relief to the community noise problem. Based on the data we have seen for SAM suppression applied to the 727 and 737 powered by the same engine we would expect slightly different numbers but the same general conclusions as for the DC-9.

One further extension of this analysis procedure is perhaps appropriate. That is to lay these contours over a map to establish the reductions which may be expected by any specific community at a specific airport. Figures 5 and 6 present an example of this application for Washington National Airport. The landings and takeoffs are toward the south with the aircraft following the path of the river.

The data indicate that for the Georgetown area the reduction expected would be about one dBA outdoors and zero indoors. For this airport the noise reduction at the FAR Part 36 location is certainly a meaningless number. Similar analysis can, of course, be conducted for noise sensitive communities at any airport.

The situation for the DC-8 is somewhat different but not radically. Figures 7 and 8 show the estimated noise reductions of the SDP-7 suppressor installed on the short duct pod version of the JT3D powered DC-8 as a function of distance for the indoor and outdoor case. While the reductions get fairly large outdoors and close to the airplane at approach and cutback thrust these reductions fade away rather quickly with distance or altitude (slant range).

Figure 9 shows the data for this suppressor in contour form. Data are provided for the outdoor case in the upper contours and for the indoor case in the lower contours. Again a Part 36 thrust cutback procedure was assumed, This is, of course, not the way these aircraft are flown. As they are flown the small takeoff contour reductions would just not occur. In either event the reductions are very limited in both magnitude and extent. Yet this is the suppressor projected to bring this aircraft into compliance with FAR Part 36 without the need of tradeoffs.

Figure 10 presents similar information for the DC-8-63 with the long duct pod and the LD2A suppressor. While the reductions are somewhat greater they are still quite limited.

The JT3D powered 707 would show still greater reductions with its SAM treatment. This is believed to be because the blow-in doors on the nacelle inlet result in a higher level of turbomachinery noise than is present or the DC-8. As a result removing these blown-in doors and adding SAM provides a greater reduction in noise level. However, the reduction is still primarily just applicable to the high frequency noise and the same kinds of limitations in the extent of the reductions achieved with distance from the aircraft would be expected.

The Concept of People Annoyed

The Noise Exposure Forecast (NEF) is the airport noise rating system which is used most extensively in this country. It suffers from all the problems of accuracy associated with contours and with predictions of human response to a complex series of noises even a long period of time. However, if viewed as a general guidance tool for estimating the reaction of communities to some future noise exposure it is of considerable value.

On the other hand there are no technical data to support the selection of any single NEF value (such as NEF 30 or NEF 40) as an index for use in estimating the change in noise disturbance resulting from changes in noise source strength. Even for a suppressor which reduces noise at all frequencies this would be questionable. NEF areas experience the same halving for each 4 dB of noise reduction as do the single event noise contours and thus tend to strongly overestimate improvement effects.

For the SAM type suppression, however, using such an evaluation procedure can be especially optimistic because the noise reductions decrease at the lower NEF values.

It has been suggested that this is perhaps not important because there is no noise problem at the lower NEF values. Our analyses do not agree with this conclusion. In fact our analyses show that the majority of the people who are highly annoyed by aircraft noise lie outside the NEF 30 exposure area. The reasons for this conclusion are illustrated in an Appendix to this note. The analysis is based on the SAGA concept which has been studied by quite a number of investigators. Rather than assuming any single exposure value and assuming all people exposed to higher levels are annoyed and those exposed to lower levels are not annoyed it assumes that the higher the noise exposure the higher the percentage of people who are annoyed. Quite a number of curves have been developed to show this relationship. While there are some major variations between them, the general conclusions to be drawn from using any one of them tends to be the same. This point is illustrated in the appendix.

It is believed that adding this type analysis to any NEF data developed to rate suppressors is essential before any meaningful conclusions can be reached.

A Simple Single Numbered Evaluation

Our studies have shown that using some sort of average or summation of the three FAR Part 36 values for an airplane can be very misleading. Locations and conditions vary for different aircraft types. Some use thrust reductions and some do not, and in any event each single value does not necessarily offer a fair representation of the noise of the aircraft.

At least some of these objections are not applicable to the evaluation of a noise suppressor. A simple system follows which may help to put the effects of SAM suppressors into a more proper perspective.

As a first step one could assume that very roughly each of the three Part 36 points is representative of one third of the problem: i.e., approach, takeoff up to the point of thrust cutback (sideline) and takeoff beyond the point of thrust cutback. For the takeoff case, actual takeoff operating procedures lie between the cutback and the non-cutback case. In the case of the DC-9-30 with the P-36 SAM suppressor, the approved data show differences between baseline hardwall and P-36 treatment as 4.0 EPNdB for approach, 1.1 EPNdB for sideline and 1.8 EPNdB for takeoff with cutback. If we assume the 1.1 EPNdB for takeoff without cutback and average between cutback and no cutback, we would obtain a 1.4 EPNdB value for the takeoff point. Averaging this value with the approach and sideline, we get a single valued average suppression of 2.2 EPNdB at the Part 36 locations. Recognizing that this evaluation applies only to locations very near the airport and outdoors, and that it is the most optimistic evaluation of the suppressor, it is easy to reach the conclusion that most neighbors would be highly disappointed with the results of a SAM retrofit program on this aircraft.

A similar analysis has been performed for other Douglas Aircraft and for several Boeing aircraft based on published data. It is shown in Figure 11.

The data for JT8D powered aircraft cluster very closely with an average reduction of from 2.0 to 2.3 EPNdB. It would thus seem reasonable to conclude that the lack of meaningful benefits demonstrated by the contours of equal noise reduction for SAM treatment on the DC-9 would also be true for the 727 and 737 aircraft.

In the case of the DC-8 the average reduction varies from about 3 to 6 EPNdB depending on the pod type and the particular suppressor. The 707 shows an average reduction of 8EPNdB, which is a little higher than for the DC-8. Again, this is thought to be attributable to deletion of the blow-in doors in addition to the SAM treatment on the 707.

Perhaps a fair summary of this evaluation would be to conclude that SAM provides an average reduction of 2 EPNdB for JT8D powered aircraft and 3 to 6 EPNdB for JT3D powered aircraft. It should be emphasized, however, that these values refer only to locations outdoors and very near the airport. The bulk of the reductions experienced by airport neighbors would be well below these due to the loss in effectiveness of SAM suppression indoors and at greater distances. Even so, they are hardly the kinds of reductions which would make the difference between an unacceptable and an acceptable environment for airport neighbors.

The Question of Timing

If a nacelle retrofit program could be accomplished overnight, it is expected that those people near the airport and directly below the approach path whose disturbance is dominated by JT3D approach noise would appreciate the effects of a SAM suppression program. However, those people represent only a small part of the people bothered by aircraft noise. In addition, any actual retrofit program would be spread out over a period from about 1977 to 1982. During that time period the JT3D powered aircraft will represent an increasingly small portion of the total jet aircraft operations. ATA has estimated that JT3D powered aircraft will account for less than 10% of the commercial jet operations in the U.S. in the 1980's. As only half those operations are approaches less than 5% of the total operation would reflect the kinds of reductions achieved for the JT3D on approach. Under these circumstances it is not expected that a SAM retrofit would make a significant contribution to the solution of the airport community noise problem.

General Conclusions

Based on the foregoing data and analyses we can only conclude that the benefits of conducting a SAM retrofit without also reducing the low frequency jet exhaust noise would be minimal and would lead to disappointment on the part of most airport neighbors. It is recognized that most airport neighbors would be pleased to hear that anything was being done and thus could become more tolerant of aircraft noise. However, it is suggested that this would be only temporary. When people realize that in most cases they have the same noise problem that was present before the retrofit, that tolerance may well backfire into a strong resentment which will make airport operations and expansion more difficult than ever.

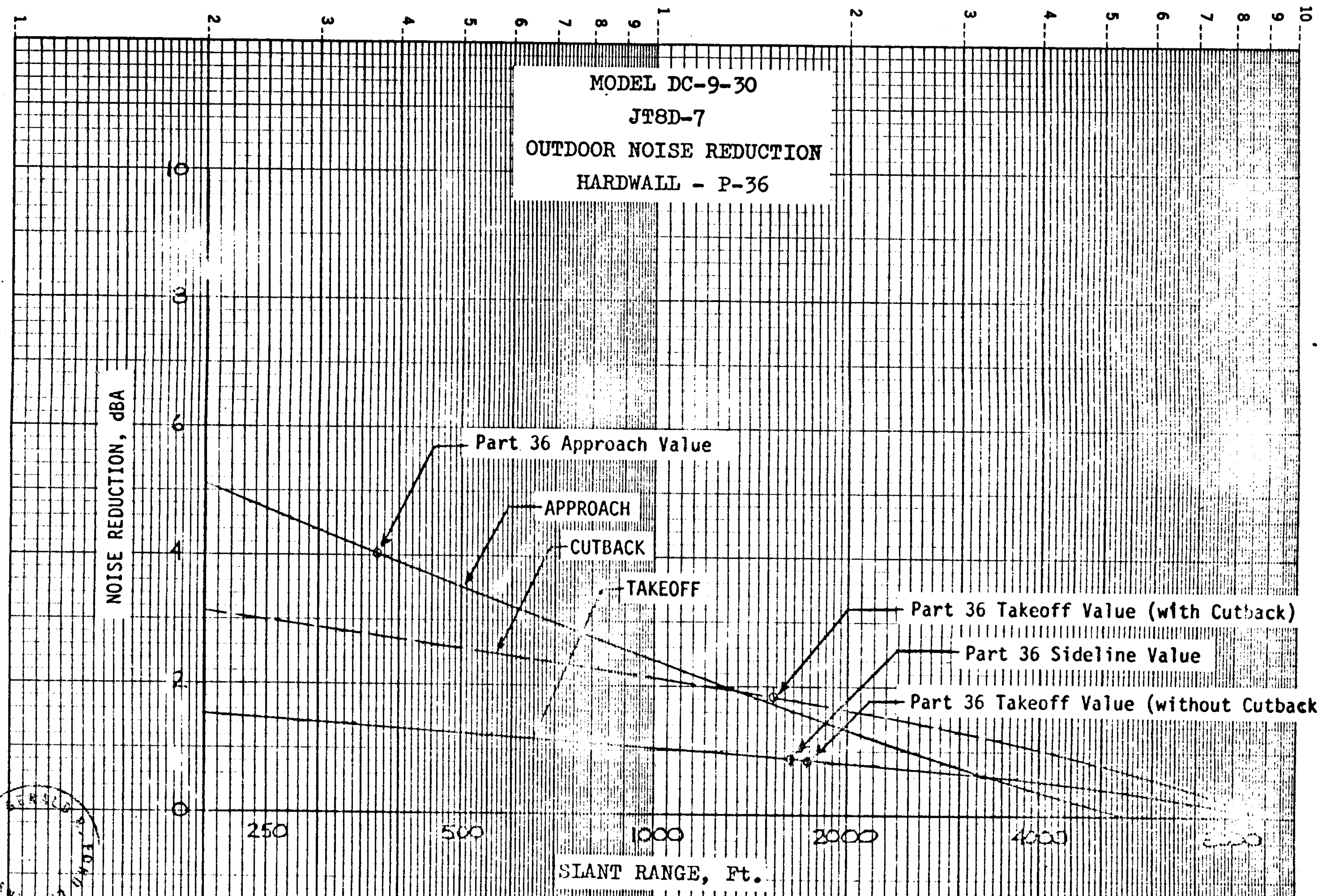

MODEL DC-9-30
JT8D-7
OUTDOOR NOISE REDUCTION
HARDWALL - P-36
NOISE REDUCTION, dBA
Part 36 Approach Value
APPROACH
CUTBACK
TAKEOFF
Part 36 Takeoff Value (with Cutback)
Part 36 Sideline Value
Part 36 Takeoff Value (without Cutback
250
500
1000
2000
4000
SLANT RANGE, Ft.

FIGURE 1

ESTIMATED CONTOURS OF EQUAL NOISE REDUCTION RESULTING FROM P-36 TREATMENT
DC-9-30
JT8D-7A ENGINES
108,000 LB. TAKEOFF AND 99,000 LB. LANDING GROSS WEIGHTS
TAKEOFF WITH CUTBACK

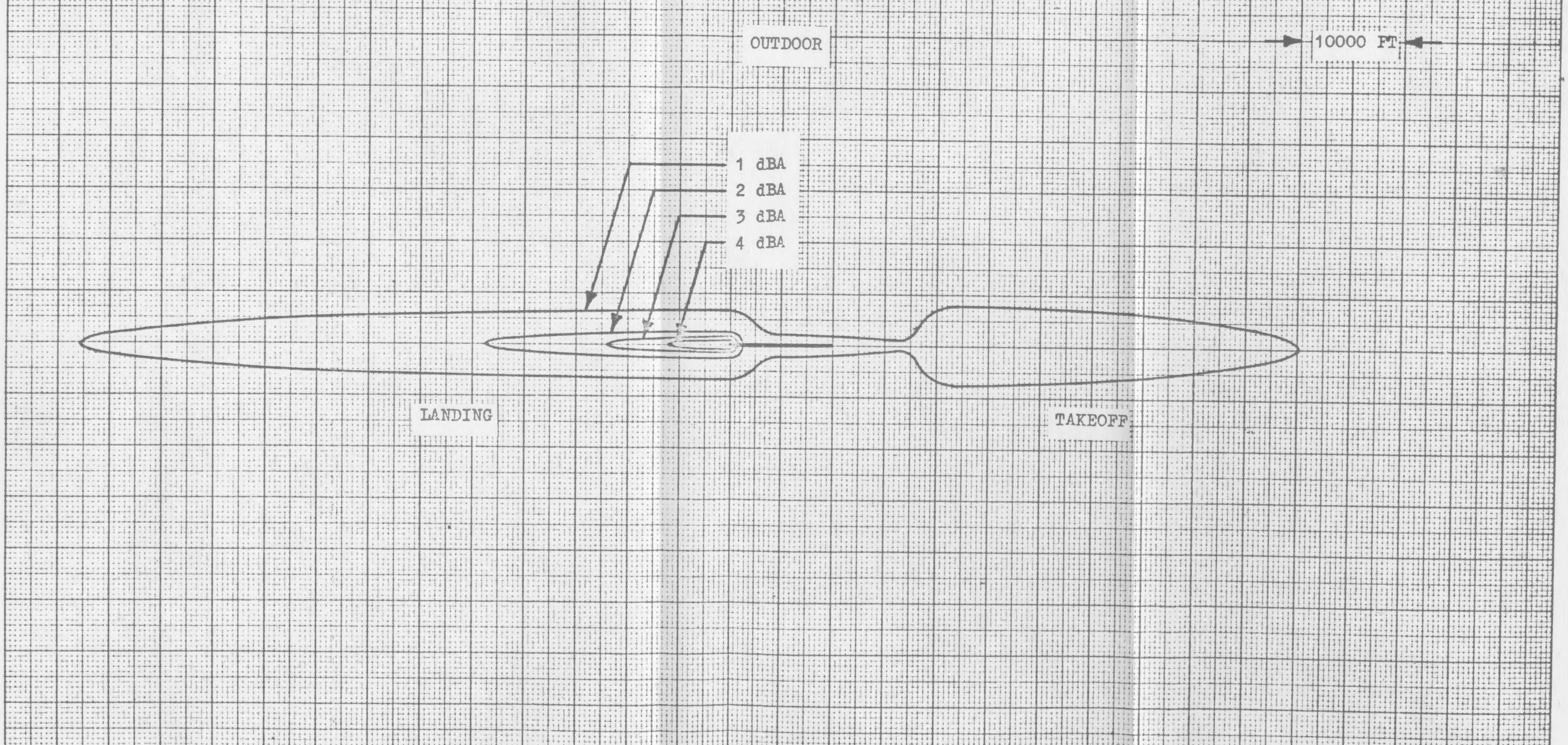


FIGURE 2

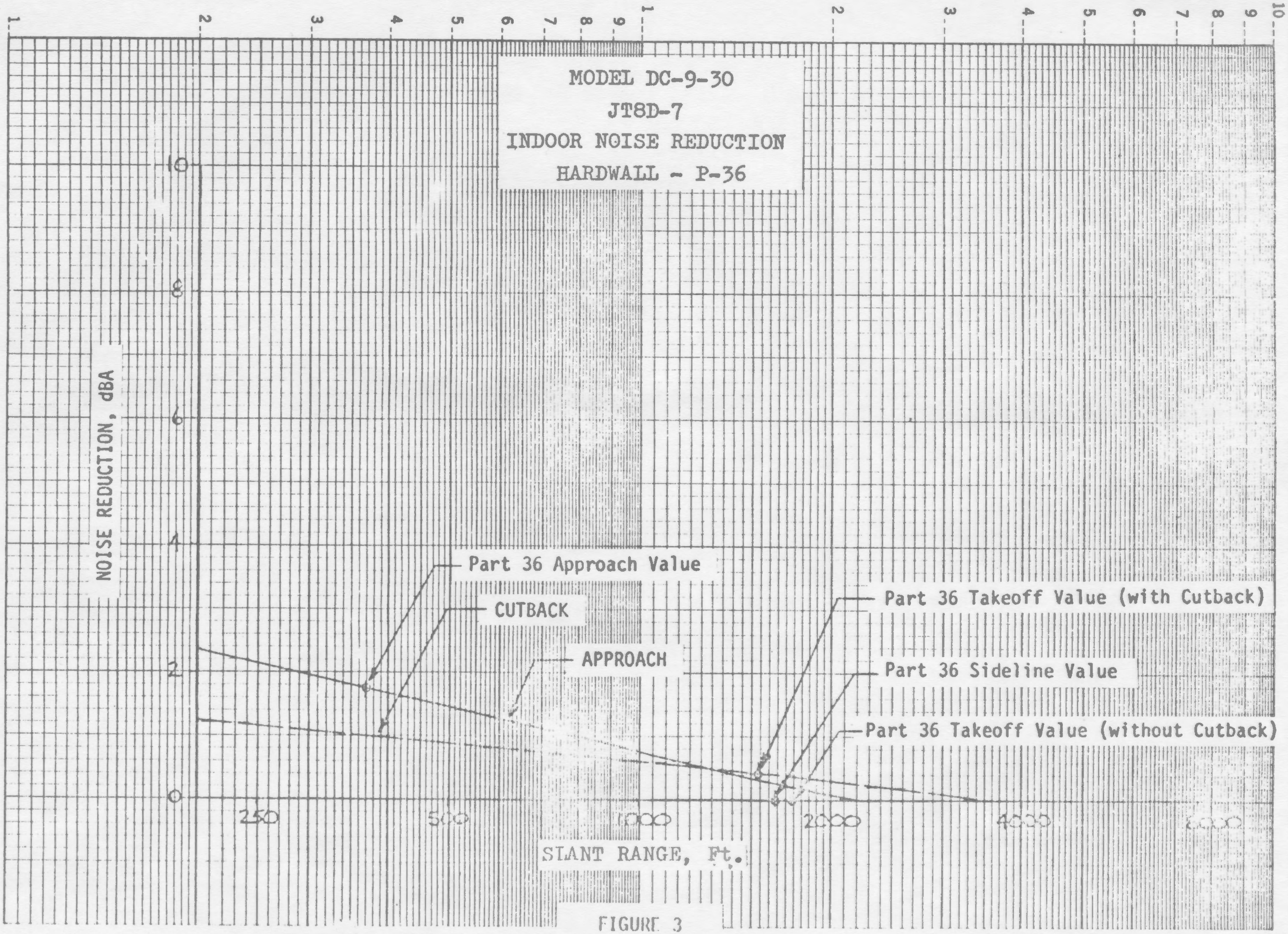

MODEL DC-9-30
JT8D-7
INDOOR NOISE REDUCTION
HARDWALL - P-36
NOISE REDUCTION, dBA
10
8
6
4
2
0
Part 36 Approach Value
CUTBACK
APPROACH
Part 36 Takeoff Value (with Cutback)
Part 36 Sideline Value
Part 36 Takeoff Value (without Cutback)
250
500
1000
2000
4000
SLANT RANGE, Ft.

FIGURE 3

ESTIMATED CONTOURS OF EQUAL NOISE REDUCTION RESULTING FROM P-36 TREATMENT
DC-9-30
JT8D-7A ENGINES
108,000 LB. TAKEOFF AND 99,000 LB. LANDING GROSS WEIGHTS
TAKEOFF WITH CUTBACK

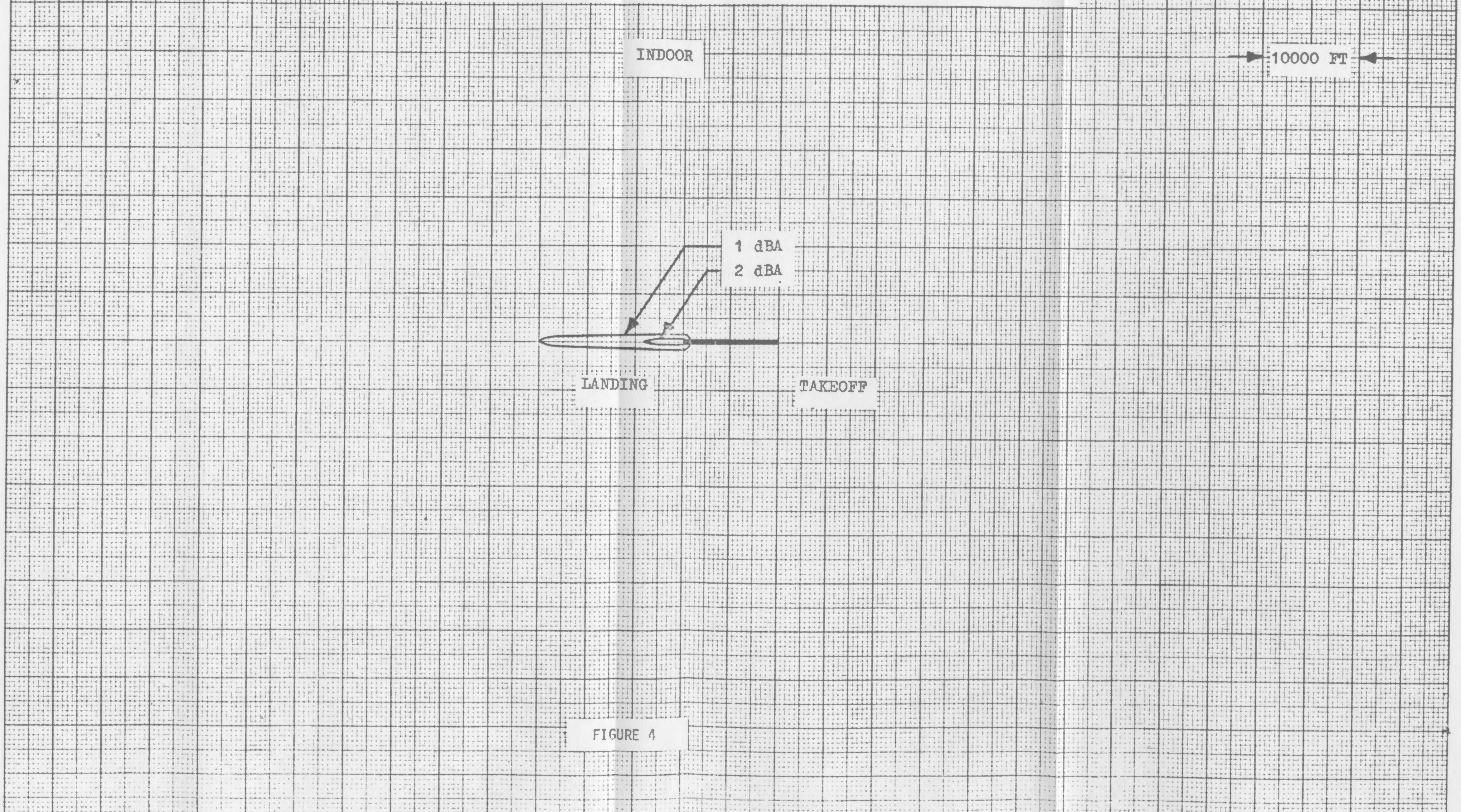


FIGURE 4

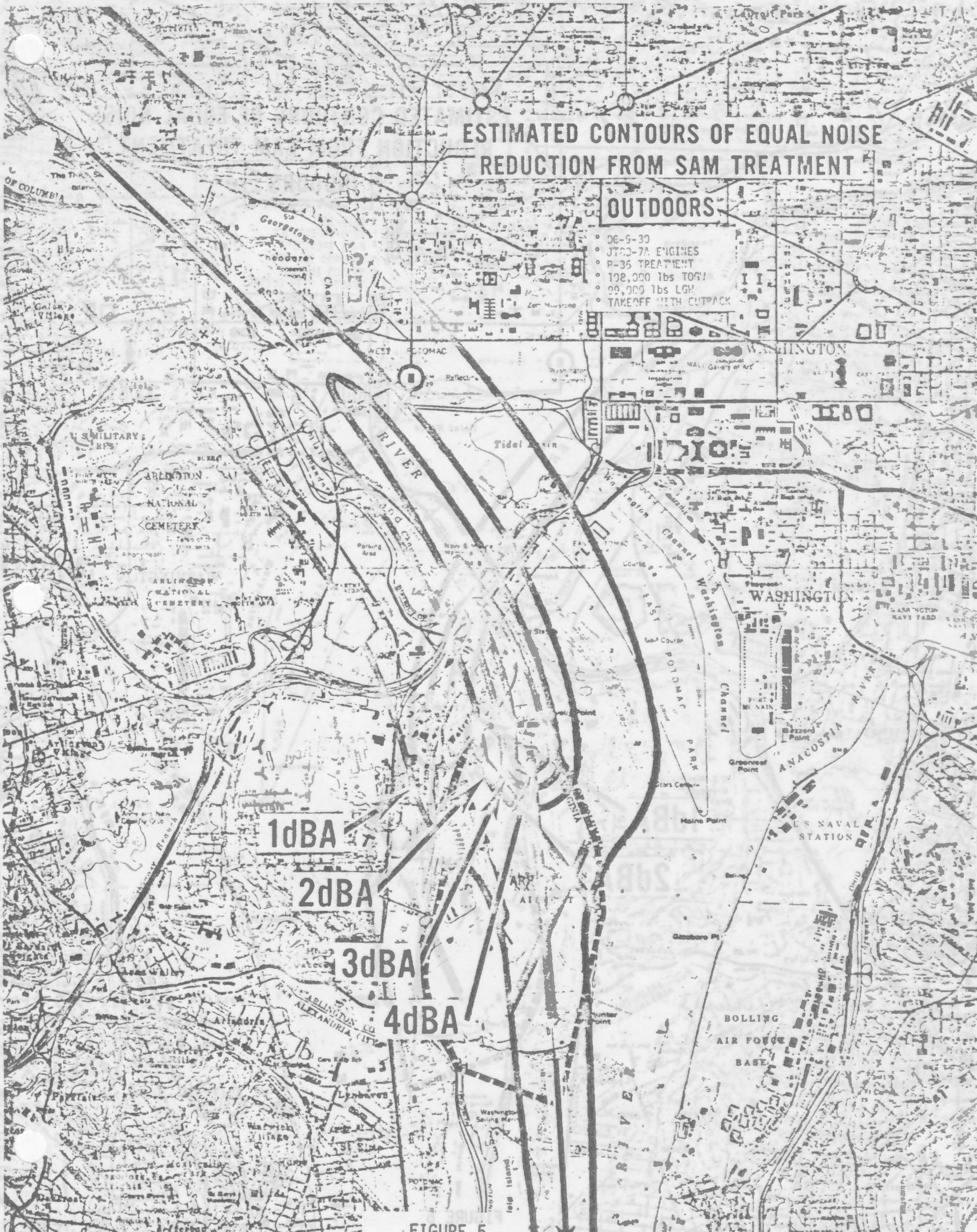

ESTIMATED CONTOURS OF EQUAL NOISE
REDUCTION FROM SAM TREATMENT
OUTDOORS
DC-9-30
JT8D-7A ENGINES
P-36 TREATMENT
108,000 lbs TOGW
99,000 lbs LGW
TAKEOFF WITH CUTBACK
1dBA
2dBA
3dBA
4dBA
WASHINGTON
ARLINGTON NATIONAL CEMETERY
POTOMAC
ANACOSTIA RIVER
U S NAVAL STATION
BOLLING AIR FORCE BASE

FIGURE 5


ESTIMATED CONTOURS OF EQUAL NOISE
REDUCTION FROM SAM TREATMENT
INDOORS
DC-9-30
JT8D-7A ENGINES
P-36 TREATMENT
108,000 lbs TOGW
99,000 lbs LGW
TAKEOFF WITH CUTBACK
1dBA
2dBA
WASHINGTON
Tidal Basin
ARLINGTON NATIONAL CEMETERY
ANACOSTIA RIVER
U.S. NAVAL STATION
BOLLING AIR FORCE BASE
EAST POTOMAC PARK
Washington Channel
Theodore Roosevelt Island
Georgetown
Reflecting Pool
Hains Point
Gravelly Point
Hunter Point
Washington Sailing Marina
VIRGINIA

FIGURE 6

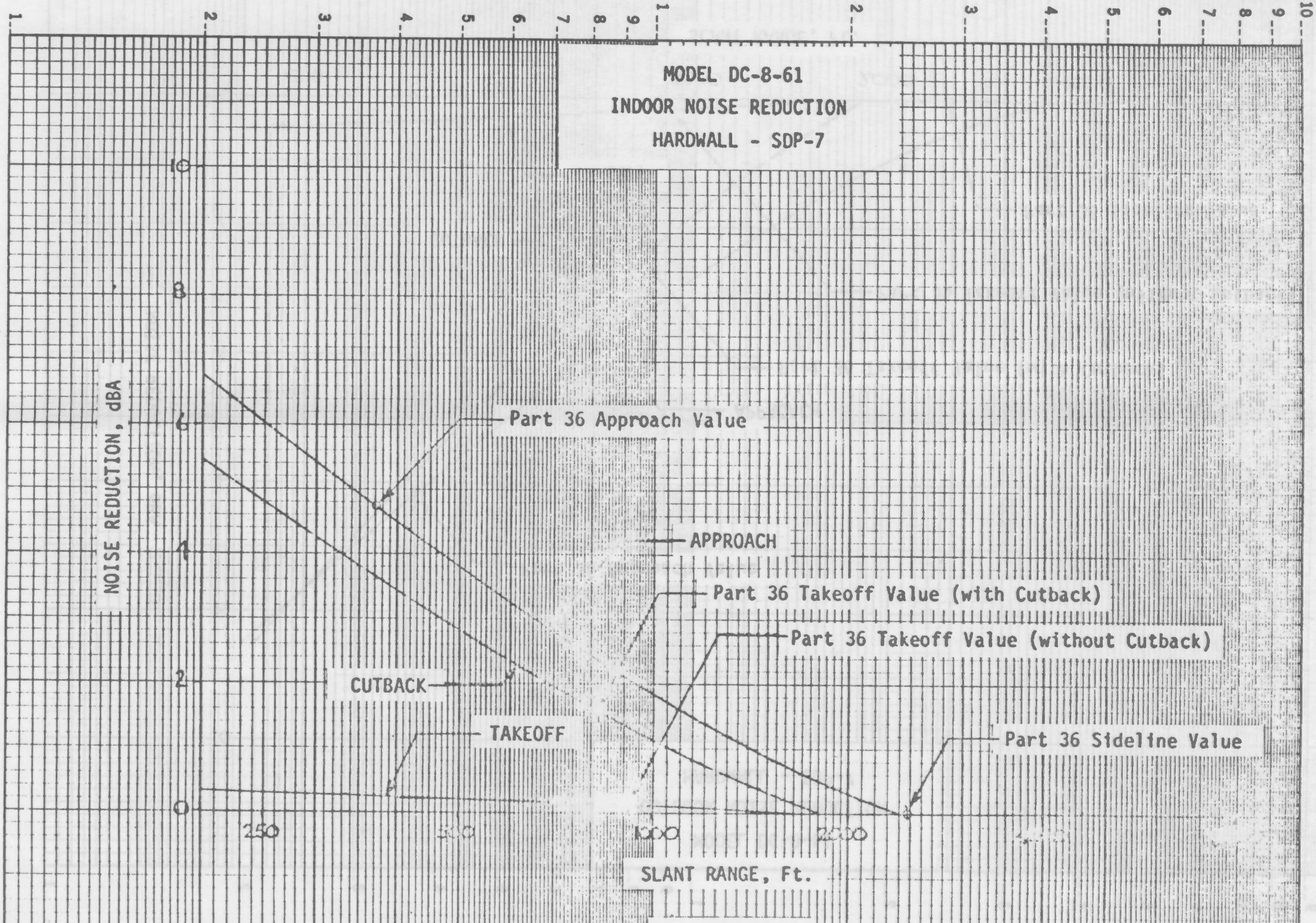
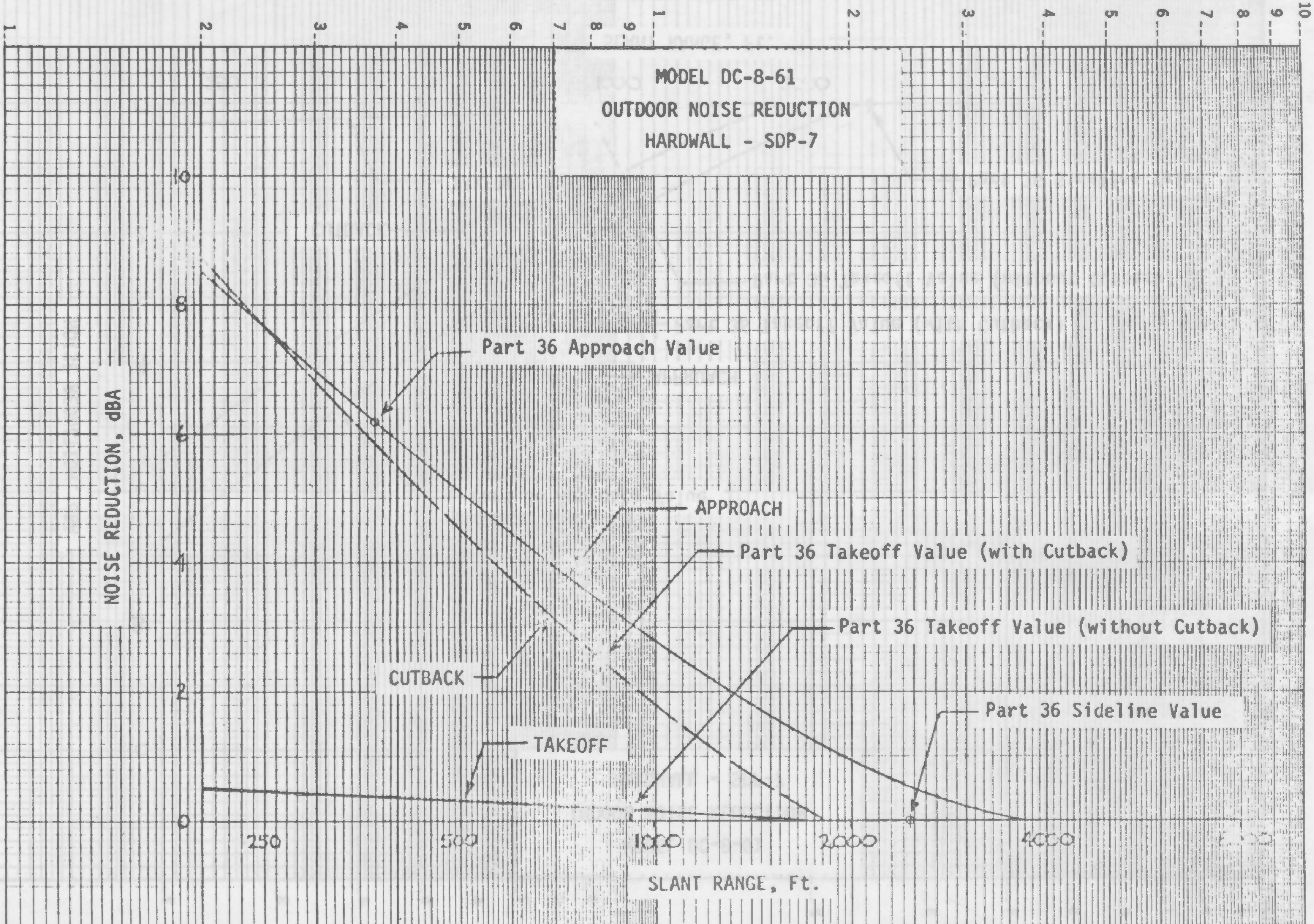

MODEL DC-8-61
INDOOR NOISE REDUCTION
HARDWALL - SDP-7
NOISE REDUCTION, dBA
Part 36 Approach Value
APPROACH
Part 36 Takeoff Value (with Cutback)
Part 36 Takeoff Value (without Cutback)
CUTBACK
TAKEOFF
Part 36 Sideline Value
SLANT RANGE, Ft.

FIGURE 7



MODEL DC-8-61
OUTDOOR NOISE REDUCTION
HARDWALL - SDP-7
NOISE REDUCTION, dBA
10
8
6
4
2
0
Part 36 Approach Value
APPROACH
Part 36 Takeoff Value (with Cutback)
Part 36 Takeoff Value (without Cutback)
CUTBACK
Part 36 Sideline Value
TAKEOFF
250
500
1000
2000
4000
SLANT RANGE, Ft.

FIGURE 8

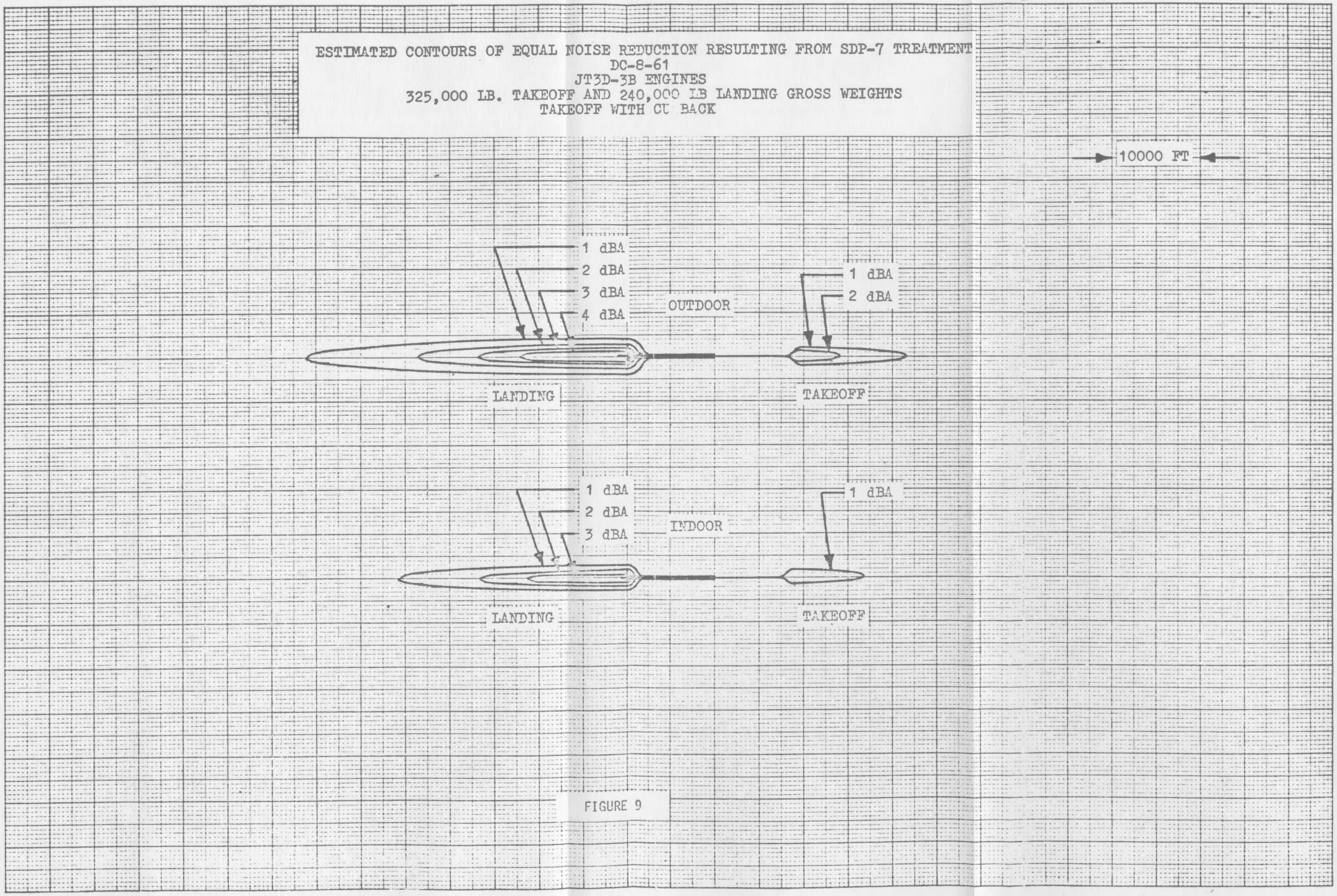

ESTIMATED CONTOURS OF EQUAL NOISE REDUCTION RESULTING FROM SDP-7 TREATMENT
DC-8-61
JT3D-3B ENGINES
325,000 LB. TAKEOFF AND 240,000 LB LANDING GROSS WEIGHTS
TAKEOFF WITH CU BACK
10000 FT
1 dBA
2 dBA
3 dBA
4 dBA
OUTDOOR
1 dBA
2 dBA
LANDING
TAKEOFF
1 dBA
2 dBA
3 dBA
INDOOR
1 dBA
LANDING
TAKEOFF

FIGURE 9

ESTIMATED CONTOURS OF EQUAL NOISE REDUCTION RESULTING FROM LD-2A TREATMENT
DC-8-63
JT3D-7 ENGINES
355,000 LB. TAKEOFF AND 275,000 LB LANDING GROSS WEIGHTS
TAKEOFF WITH CUTBACK

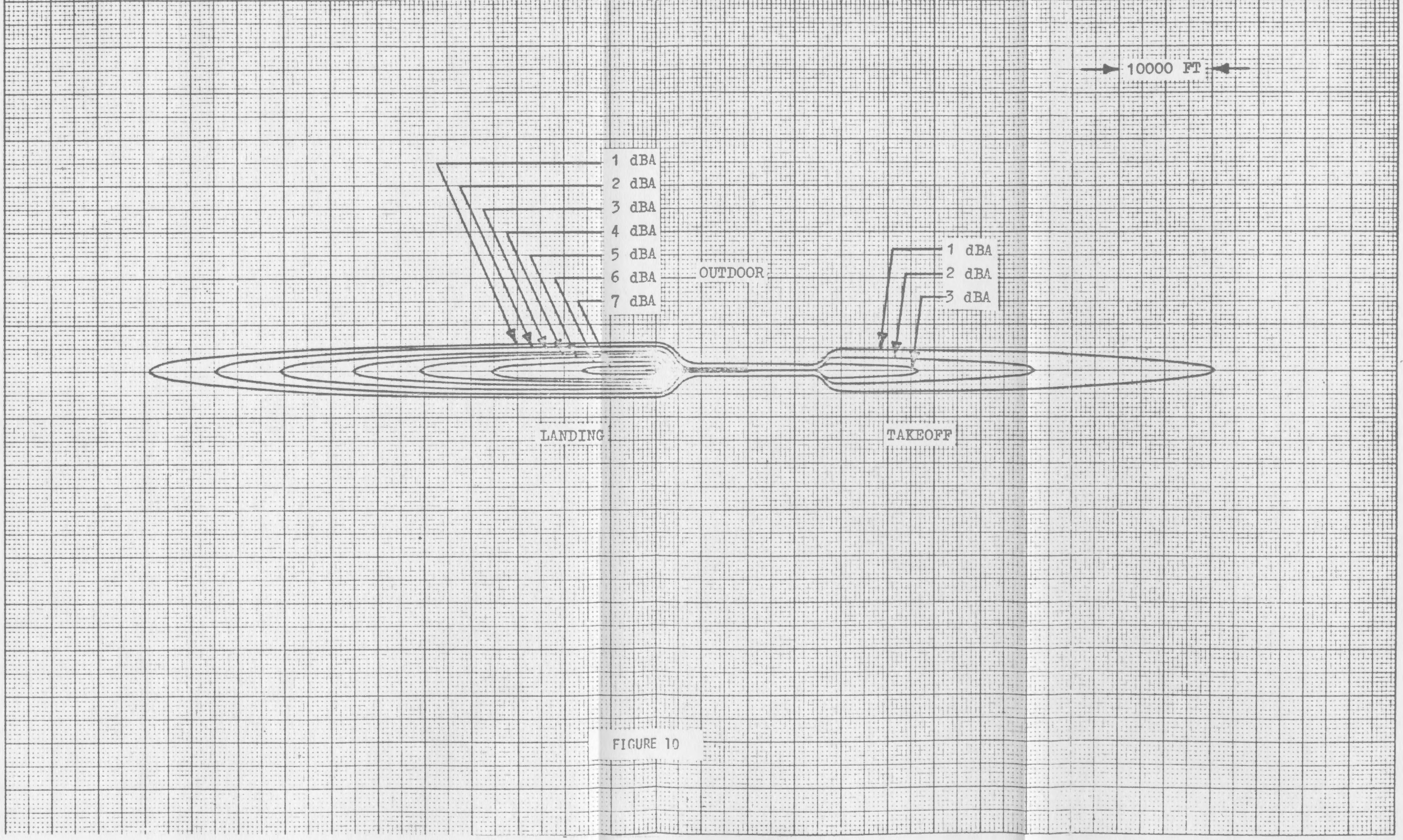


FIGURE 10

OUTDOOR SUPPRESSION BASED ON SIMPLE RATING METHOD

AIRCRAFT	TREATMENT	REDUCTION (EPNdB)
DC-9	P-36	2.2
DC-8	SDP 5	2.7
DC-8	SDP 7	3.2
DC-8	LD2A	4.7
DC-8	LD2C	6.0
707	QN	8.0
727	QN	2.3
737	QN	2.0

FIGURE 11

APPENDIX

IMPORTANCE OF THE MINIMUM NEF VALUE USED IN STUDIES OF VARIOUS AIRCRAFT NOISE REDUCTION ALTERNATIVES

The following analysis was prepared to demonstrate the importance of selecting the minimum NEF to be used in studies of various aircraft noise reduction alternatives. While the analysis does not offer a specific minimum NEF value it indicates that too high a minimum value can omit from consideration the major part of the people highly annoyed by aircraft noise.

Figure 1 is a sample set of computer printed NEF contours from values 25 to 40. It is taken directly from a report prepared by Bolt, Beranek and Newman. It is actually only a portion of the contours but if one neglects the airport property the relative areas enclosed by the different contours are somewhat representative of those in a typical airport situation. The approximate areas of each contour value were measured with a plaimimeter and are plotted on semilog paper in Figure 2 as a function of the NEF value. The circles are points measured on Figure 1. The line is a visual fit extrapolated down to an NEF value of 20. The relationship of increasing area with decreasing NEF value from this figure has been used in the analysis that follows.

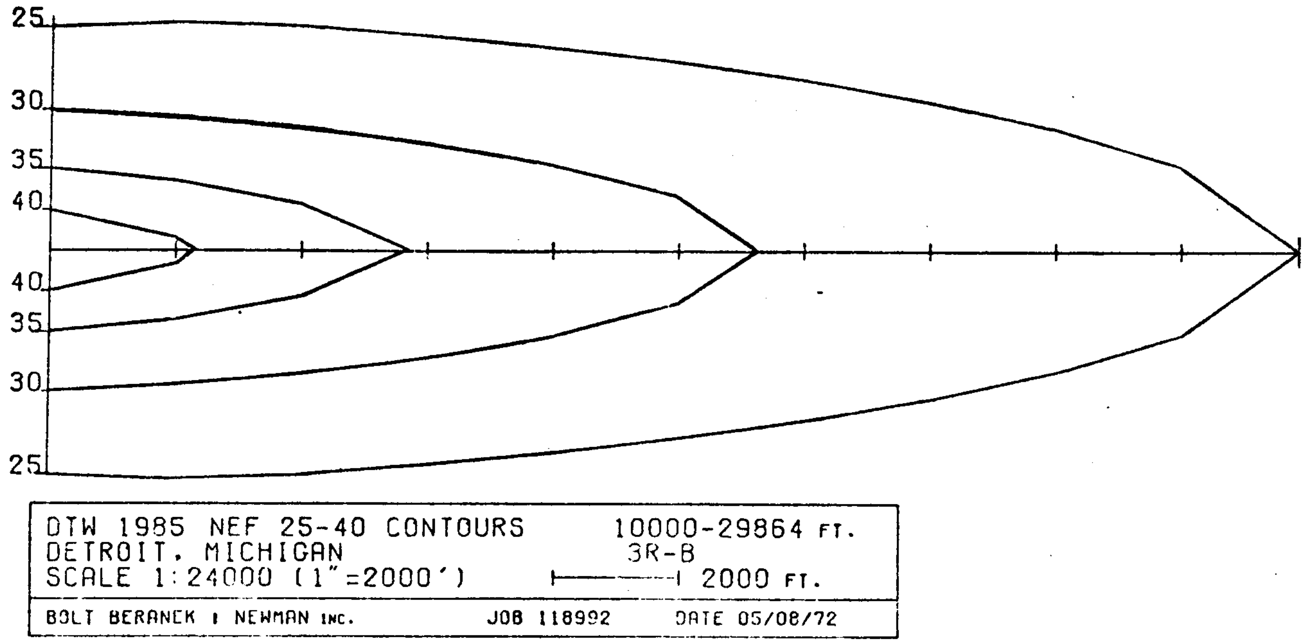
Table 1a lists the area enclosed by each contour value and Table 1B the contour area between NEF values of 5 NEF intervals from NEF 20 to NEF 40. Table 1c lists the total population for each of the contour intervals based on an assumption of 3500 people per square mile.

Figure 3 relates the percentage of people highly annoyed to the NEF value to which they are exposed. The lower curve is taken directly from DOT information. The upper curve is from Figure 238a of Karl Kryter's book. Kryter's curve uses the terminology "Estimated percent of people rating noise as unacceptable for residential living."

Table 2 shows the steps to determine the number of people within each of the contour intervals who are highly annoyed. This was a simple numerical integration and the percentage people annoyed value for each interval was selected as that at the midpoint of the interval.

Table 3 is similar to Table 2 except that Kryter's curve was used rather than the DOT curve.

With either the DOT curve or the Kryter curve the general conclusion would be about the same. Most of the people who are highly annoyed live beyond the NEF 30 contour. In fact, for this particular set of assumptions there are about five times as many people highly annoyed in the NEF 20 to 30 interval as there are in the NEF 30 to 40 interval. This kind of analysis needs to be made for other situations but this one is probably representative of the situation at many airports. When one is examining the relative benefits of noise reduction alternatives which might vary in there relative effectiveness between an NEF 20 and an NEF 30 area reduction, selecting NEF 30 as a minimum value for the analysis could lead to the wrong conclusions.



EXAMPLE OF COMPUTER PRINTED NEF CONTOURS FOR ONE FLIGHT SEGMENT

FIGURE 1

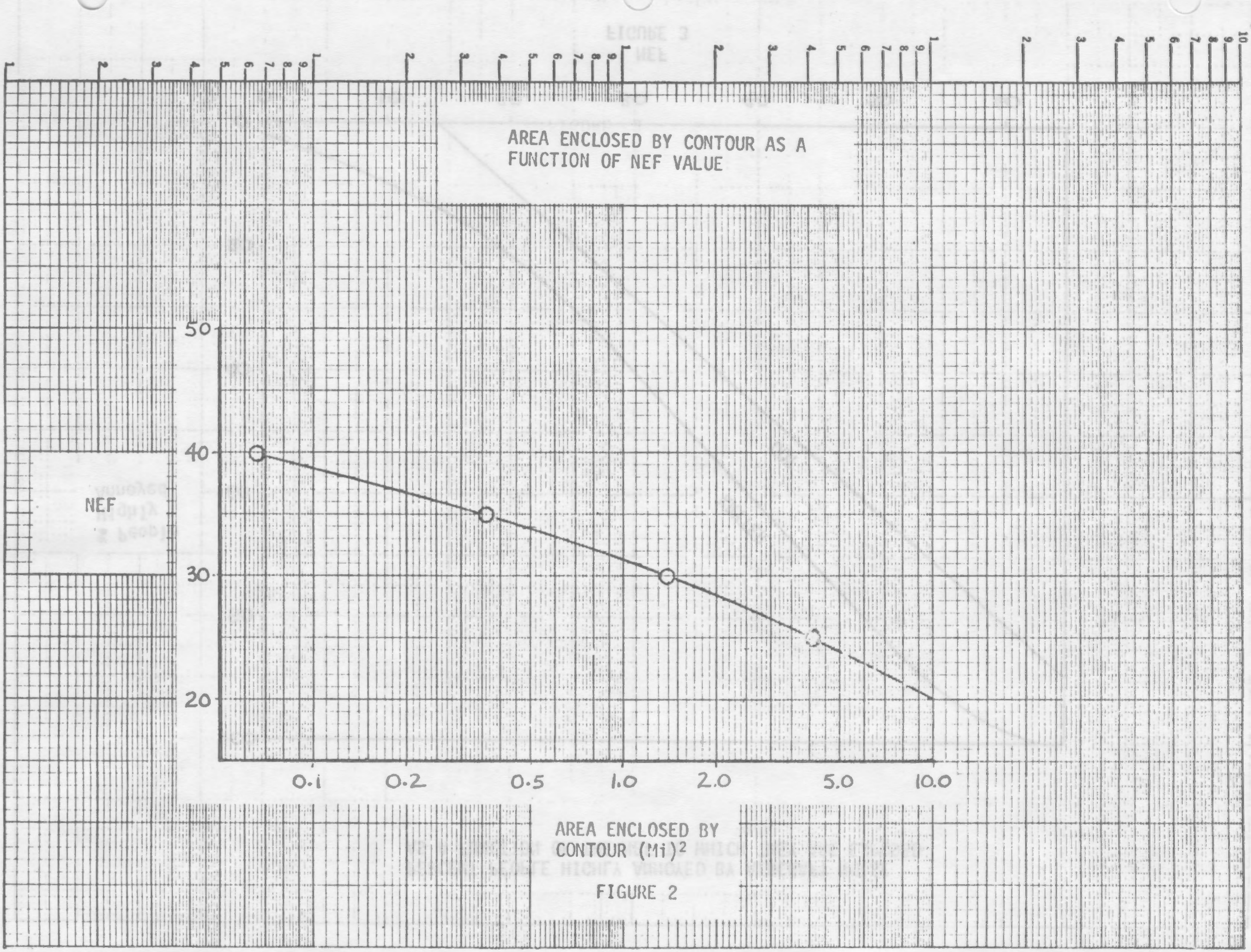
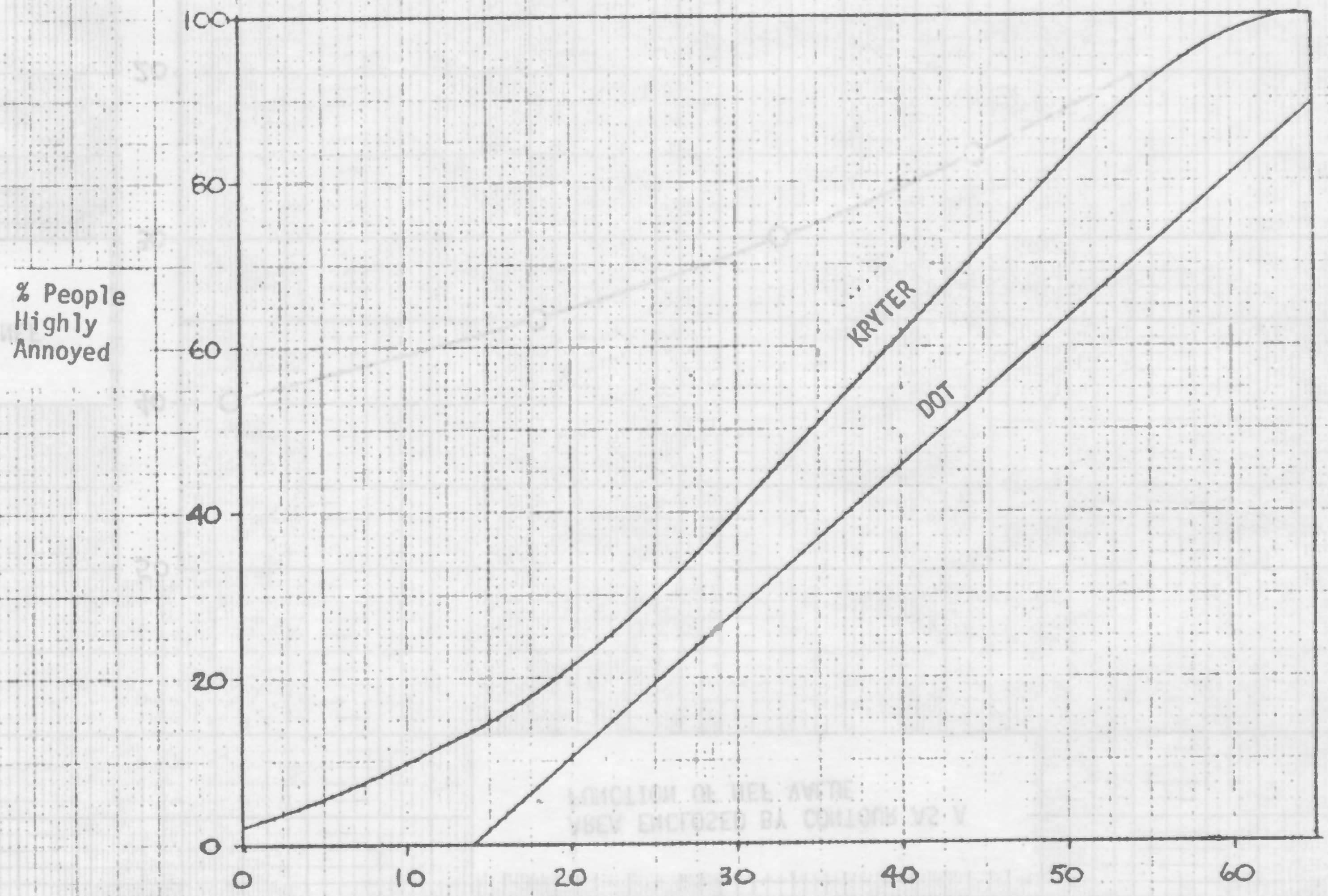

AREA ENCLOSED BY CONTOUR AS A FUNCTION OF NEF VALUE
NEF
50
40
30
20
0.1
0.2
0.5
1.0
2.0
5.0
10.0
AREA ENCLOSED BY CONTOUR (Mi)²

FIGURE 2

PERCENT PEOPLE HIGHLY ANNOYED BY AIRCRAFT NOISE
AS A FUNCTION OF THE NEF TO WHICH THEY ARE EXPOSED



NEF

FIGURE 3

NEF	CONTOUR AREA $(MI)^2$
20	10.000
25	4.020
30	1.335
35	0.359
40	0.065

1a Contour Areas

NEF INTERVAL	CONTOUR INTERVAL AREA $(MI)^2$
20 to 25	5.980
25 to 30	2.685
30 to 35	0.976
35 to 40	0.294

1b Contour Interval Areas

NEF INTERVAL	CONTOUR INTERVAL AREA $(MI)^2$	TOTAL POPULATION IN AREA
20 to 25	5.980	14,950
25 to 30	2.685	6,720
30 to 35	0.976	2,440
35 to 40	0.294	735

1c Population in Each Contour Interval Area Assuming 2500 People per $(MI)^2$

TABLE 1

HIGHLY ANNOYED PEOPLE BASED ON DOT CURVE

NEF INTERVAL	POPULATION	PERCENT HIGHLY ANNOYED	PEOPLE HIGHLY ANNOYED	PERCENT OF TOTAL HIGHLY ANNOYED PEOPLE
20 to 25	14,950	15	2245	45.6
25 to 30	6,720	23.7	1593	32.3
30 to 35	2,440	32.3	788	16.0
35 to 40	735	41	301	6.1
20 to 30	21,670	-	3838	77.9
30 to 40	3,175	-	1089	22.1
20 to 40	24,845	-	4927	100

TABLE [illegible]

HIGHLY ANNOYED PEOPLE BASED ON KRYTER CURVE

NEF INTERVAL	POPULATION	PERCENT HIGHLY ANNOYED	PEOPLE HIGHLY ANNOYED	PERCENT OF TOTAL HIGHLY ANNOYED PEOPLE
20 to 25	14,950	25.3	3785	49.4
25 to 30	6,720	35	2350	30.7
30 to 35	2,440	45.3	1106	14.5
35 to 40	735	55.8	410	5.4
20 to 30	21,670	-	6135	80.1
30 to 40	3,175	-	1516	19.9
20 to 40	24,845	-	7651	100

TABLE 3

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APPENDIX H: BIBLIOGRAPHY

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APPENDIX I: FAR PART 36 COMPLIANCE REGULATION SUMMARY

APPENDIX I: SUMMARY OF FAR PART 36 COMPLIANCE REGULATION

I. Effective Date of Regulation: January 1, 1977

II. Regulation Application: U.S. civil aircraft operating under FAR Parts 91, 121, 123, and 135.

III. Standards: FAR Part 36 Levels

IV. Phasing or Scheduling of Application:

Aircraft Class Impacted	TIME SCHEDULE Before 1/1/81	Before 1/1/83	Before 1/1/85
o 4-engine airplanes with bypass ratio less than 2 including pure jets (B-707, DC-8).	25% Compliance	50% Compliance	100% Compliance
o 4-engine airplanes with bypass ratio greater than 2 (B-747).	50% Compliance	100% Compliance	-
o 2- and 3-engine airplanes	50% Compliance	100% Compliance	-