Rules and Regulations

Title 16—COMMERCIAL PRACTICES

Chapter I—Federal Trade Commission

PART 15—ADMINISTRATIVE OPINIONS AND RULINGS

Origin of Imported Brush for Hair Roller

§ 15.386 Origin of imported brush for hair roller.

(a) The Commission issued an advisory opinion with regard to the question of whether it is necessary to disclose the origin of the imported brush which is assembled with American made components to form a brush hair roller.

(b) It is proposed to produce a hair roller in the United States. The roller consists of three components: spiral spring, netting, and brush insert. The brush insert is manufactured in a foreign country. The spiral spring and netting are manufactured in the United States. All assembling is done in the United States. The cost of the brush accounts for less than 25 percent of the total cost of the hair roller as marketed. The question involved is whether the foreign origin of the brush must be marked on the printed card which will be used in packaging the roller.

(c) The Commission expressed the opinion that, in the absence of any affirmative representation that the product is made in the United States, or any other representation that might mislead the public as to the country of origin, and in the absence of other facts indicating actual deception, the failure to mark the origin of the imported component would not be regarded by the Commission as deceptive.

(38 Stat. 717, as amended; 15 U.S.C. 41–58)

Issued: November 17, 1969.

By direction of the Commission.

[SEAL] JOSEPH W. SHEA, *Secretary.*

[F.R. Doc. 69–13623; Filed, Nov. 17, 1969; 8:45 a.m.]

PART 15—ADMINISTRATIVE OPINIONS AND RULINGS

Tripartite Promotional Plan in Grocery Field

§ 15.387 Tripartite promotional plan in the grocery field.

(a) The Commission issued an advisory opinion with respect to a proposed tripartite promotional plan which proposed to secure advertising from packagers of food and grocery products and place ads in retail stores. The display ad will measure 22" x 21" and can be located in the middle of the store with or without aisle directory information or it can be divided in half and placed on the wall of the store. Payments to stores would be calculated in terms of the number of ads installed, the rate per ad to vary with the monthly traffic in the store, the minimum payment to be $4.25 per month per ad, and the smaller grocery stores will be paid more proportionally than larger stores. Competing retailers would be informed of the opportunity to participate in the plant through personal solicitations, advertisements in trade journals, and direct mailings to every grocery retailer in the country which has been in business for a period of at least 6 months.

(b) The Commission stated that the proposed method of calculating payments to stores, if implemented as stated, would not violate the requirements of proportionally equal terms in Guide 7 of the Commission's Guides for Advertising Allowances and Other Merchandising Payments and Services (May 29, 1969). The proposed method of informing competing retailers of the opportunity to participate in the plan, if implemented in good faith, seems to satisfy the requirements of Guide 13(a)(1). As long as nonfood items and food items likely to be sold in stores other than supermarkets are not advertised a plan to provide availability to all grocery stores of all sizes would meet the requirements of availability to all competing customers as required by Guide 9. The proposed ad which can be used in an aisle or on the wall of a store would appear to be "usable in a practical business sense" in a store of any size. Thus the plan satisfies the requirements of Guide 9 that the plan "* * * should in its terms be usable in a practical business sense by all competing customers." Therefore, no alternative plan seems to be required in the absence of proof that some customers cannot in fact make use of the proposed ads.

(c) The Commission advised that were the plan implemented as proposed, the Commission would have no objection to it. The Commission pointed out that were the plan implemented in a different manner, the promoter, the supplier, and the retailer might be acting in violation of section 2(d) or (e) of the Clayton Act, as amended, and/or section 5 of the Federal Trade Commission Act.

(38 Stat. 717, as amended; 15 U.S.C. 41–58; 49 Stat. 1526; 15 U.S.C. 13, as amended)

Issued: November 17, 1969.

By direction of the Commission.

[SEAL] JOSEPH W. SHEA, *Secretary.*

[F.R. Doc. 69–13624; Filed, Nov. 17, 1969; 8:45 a.m.]

PART 15—ADMINISTRATIVE OPINIONS AND RULINGS

"Bonus" Portable Typewriter Offer

§ 15.388 "Bonus" portable typewriter offer.

(a) The Commission issued an advisory opinion relative to proposed advertising of "bonus" typewriters. The proposed advertisement would offer a portable typewriter as a "bonus" to any one accepted for enrollment in a correspondence course. Readers were invited "to write for information," but the prerequisites to the receipt of the "bonus" typewriter were not disclosed.

(b) The Commission advised that it "* * * is of the view that the advertisement in the circumstances described would be misleading and deceptive and in possible violation of section 5 of the Federal Trade Commission Act in several respects. For one thing, the "bonus" offer is to be a continuing offer, which means that the regular price for the training course of $595 includes the typewriter; the typewriter would not, therefore, be a "bonus". Also, the proposed advertisement does not make clear that what is being sold for a fee is a training course in motel management and that the so-called "bonus" typewriter is offered only in connection with such course.

(c) "Moreover, even were the typewriter to be given as a true bonus, as, for example, if a time-limited offer was made without a change in tuition, the proposed advertisement would still be deceptive and misleading because the terms and conditions for the receipt of the typewriter are not disclosed, including, it appears, an advance payment of $595 tuition for a motel training course.

(d) "Furthermore, the proposed advertisement is deceptive because, taken as a whole, it tends to convey the impression that service is not being sold but, rather, that a gift is to be given to specially qualified persons who are willing to consider a career in motel management."

(38 Stat. 717, as amended; 15 U.S.C. 41–58)

Issued: November 17, 1969.

By direction of the Commission.

[SEAL] JOSEPH W. SHEA, *Secretary.*

[F.R. Doc. 69–13625; Filed, Nov. 17, 1969; 8:45 a.m.]

PART 15—ADMINISTRATIVE OPINIONS AND RULINGS

Disclosure of Foreign Assembly Operations on Ladies' Blouses

§ 15.389 Disclosure of foreign assembly operations on ladies' blouses.

(a) The Commission advised that it would not be necessary to disclose the foreign country of origin where certain

assembly operations are performed on ladies' blouses.

(b) Under the factual situation involved in the ruling, the synthetic fabric, buttons and thread will all be of domestic origin. The fabric will be cut in the United States and thereafter shipped to Trinidad where it will be assembled. Assembly operations in Trinidad will consist of sewing, pressing and trimming. Approximately 26.4 percent of total production costs will be of foreign origin, with the remaining 73.6 percent representing domestic costs.

(c) Concluding that a disclosure would not be required under section 4(b)(4) of the Textile Fiber Products Identification Act or section 5 of the FTC Act, the Commission said: "In the absence of any affirmative representation that the finished product is made entirely in the United States, the Commission has concluded that it will not be necessary to disclose the nature and extent of the foreign operations performed on the ladies' blouses."

(38 Stat. 717, as amended; 15 U.S.C. 41–58).

Issued: November 17, 1969.

By direction of the Commission.

[SEAL] JOSEPH W. SHEA, *Secretary.*

[F.R. Doc. 69–13626; Filed, Nov. 17, 1969; 8:45 a.m.]

Title 7—AGRICULTURE

Chapter IX—Consumer and Marketing Service (Marketing Agreements and Orders; Fruits, Vegetables, Nuts), Department of Agriculture

[Tangelo Reg. 38]

PART 905—ORANGES, GRAPEFRUIT, TANGERINES, AND TANGELOS GROWN IN FLORIDA

Limitation of Shipments

Findings. (1) Pursuant to the marketing agreement, as amended, and Order No. 905, as amended (7 CFR Part 905, 34 F.R. 12426), regulating the handling of oranges, grapefruit, tangerines, and tangelos grown in Florida, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the committees established under the aforesaid amended marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of tangelos, as hereinafter provided, will tend to effectuate the declared policy of the act.

(2) The recommendation by the committees, as to the minimum grade and sizes of tangelos in fresh shipments, reflects their appraisal of current crop and market conditions. More restrictive size regulation should be made effective no later than November 17, 1969, because fresh tangelo shipments have increased substantially during the past week and market prices are weakening. The size of tangelos in the developing crop has increased since the inception of seasonal regulation, hence, a larger minimum size together with continuation of the current minimum grade, as hereinafter specified, is needed to maintain or increase returns to producers through a reduction in the marketable supply for fresh shipment while providing consumers with more desirable tangelos of larger sizes. The recommendation by the committees also reflects their appraisal of the potential marketing situation during the week in which Thanksgiving Day occurs and for the period immediately following. Historically, there has been heavy purchasing of fresh tangelos in the terminal markets prior to Thanksgiving Day followed by a period of slow movement immediately following the holiday. Inordinate shipments in the period of slow movement tend to depress market prices and returns to growers. Hence, the curtailment of tangelo shipments, as hereinafter specified, is necessary to prevent a buildup of tangelo supplies in the markets during and immediately following the Thanksgiving Day week in order to prevent unduly depressed market prices and returns to growers.

(3) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rulemaking procedure, and postpone the effective date of this regulation until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 553) in that the time intervening between the date when information upon which this regulation is based became available and the time when this regulation must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than November 17, 1969. Domestic shipments of Florida tangelos are currently regulated by grade and size pursuant to Tangelo Regulation 37 (34 F.R. 14379), and, unless sooner terminated or modified, will continue to be so regulated through September 13, 1970; determinations as to need for, and extent of, regulation under § 905.52(a)(3) of the order must await the development of the crop and the availability of information about the demand for such fruit; the recommendation and supporting information for regulation of tangelo shipments subsequent to November 17, 1969, and for limiting the total quantity of fresh tangelos by prohibiting the shipment thereof pursuant to § 905.52(a)(3) during the period November 25, through November 27, 1969, as herein provided, were promptly submitted to the Department after an open meeting on November 11, 1969, to consider recommendations for such regulation, after giving due notice of such meeting, and interested persons were afforded an opportunity to submit their views at this meeting; information regarding the provisions of the regulation recommended by the committee has been disseminated among shippers of tangelos, grown in the production area, and this regulation will not require any special preparation on the part of the persons subject thereto which cannot be completed by the effective time hereof.

§ 905.518 Tangelo Regulation 38.

(a) Order: (1) Tangelo Regulation 37 (34 F.R. 14379) is hereby terminated November 17, 1969.

(2) During the periods from November 17, to November 25, 1969, and from November 28, 1969, through September 13, 1970, no handler shall ship between the production area and any point outside thereof in the continental United States, Canada, or Mexico:

(i) Any tangelos, grown in the production area, which do not grade at least U.S. No. 1; or

(ii) Any tangelos, grown in the production area, which are smaller than $2^9/_{16}$ inches in diameter, except that a tolerance of 10 percent, by count, of tangelos smaller than such minimum diameter shall be permitted, which tolerance shall be applied in accordance with the provisions for the application of tolerances, specified in the U.S. Standards for Florida Oranges and Tangelos: *Provided,* That during any week of the periods specified in this subparagraph (2), any handler may ship a quantity of tangelos which are smaller than the size prescribed in this subdivision (ii) if (*a*) the number of standard packed boxes of such smaller tangelos does not exceed 25 percent of the total shipments of tangelos by such handler during the last previous week, within the current fiscal period, in which he shipped tangelos; and (*b*) such smaller tangelos are of a size not smaller than $2^5/_{16}$ inches in diameter, except that a tolerance of 10 percent, by count, of tangelos smaller than such minimum diameter shall be permitted, which tolerance shall be applied in accordance with the provisions for the application of tolerances specified in said U.S. Standards for Florida Oranges and Tangelos.

(3) During the period from November 25, through November 27, 1969, no handler shall ship between the production area and any point outside thereof in the continental United States, Canada, or Mexico, any tangelos, grown in the production area.

(b) Terms used in the amended marketing agreement and order shall, when used herein, have the same meaning as is given to the respective term in said amended marketing agreement and order; and terms relating to grade and diameter, as used herein, shall have the same meaning as is given to the respective term in the U.S. Standards for Florida Oranges and Tangelos (§§ 51.1140–51.1178 of this title); the term "week" shall mean the 7-day period beginning at 12:01 a.m., local time, on Monday of 1 calendar week and ending at 12:01 a.m., local time, on Monday of the following calendar week.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: November 14, 1969.

FLOYD F. HEDLUND, *Director, Fruit and Vegetable Division, Consumer and Marketing Service.*

[F.R. Doc. 69–13705; Filed, Nov. 14, 1969; 11:26 a.m.]

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Administration, Department of Transportation

SUBCHAPTER C—AIRCRAFT

[Docket No. 9337; Amdt. 21-27]

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS

PART 36—NOISE STANDARDS: AIRCRAFT TYPE CERTIFICATION

Adoption of Noise Type Certification Standards and Procedures

This amendment adds new Part 36 to the Federal Aviation Regulations. The purpose of this amendment is to implement 49 U.S.C. 1431 (Public Law 85-726, Title IV, § 611, as added Public Law 90-411, § 1, July 21, 1968, 82 Stat. 395), by prescribing noise standards for the type certification of subsonic transport category airplanes and for the type certification of subsonic turbojet powered airplanes regardless of category. This amendment also contains procedural changes to Part 21 of the Federal Aviation Regulations made necessary by the addition of new Part 36. This amendment initiates the noise abatement regulatory program of the Federal Aviation Administration under the new statutory authority.

This amendment is based on a notice of proposed rule making (Notice 69-1) issued on January 3, 1969, and published in the FEDERAL REGISTER on January 11, 1969 (34 F.R. 453).

I. *Relation to responsibility of airport proprietors.* Compliance with Part 36 is not to be construed as a Federal determination that the aircraft is "acceptable," from a noise standpoint, in particular airport environments. Responsibility for determining the permissible noise levels for aircraft using an airport remains with the proprietor of that airport. The noise limits specified in Part 36 are the technologically practicable and economically reasonable limits of aircraft noise reduction technology at the time of type certification and are not intended to substitute federally determined noise levels for those more restrictive limits determined to be necessary by individual airport proprietors in response to the locally determined desire for quiet and the locally determined need for the benefits of air commerce. This limitation on the scope of Part 36 is required for consistency with the responsibilities placed upon the airport proprietor by the U.S. Supreme Court in Griggs v. Allegheny County, 369 U.S. 84 (1962). Consistent with this limited scope, this amendment specifies that the Federal Aviation Administration makes no determination, under Part 36, on the acceptability of the prescribed noise levels in any specific airport environment (see §§ 36.5 and 36.1581(a)).

II. *Summary of public comments.* A total of 1,428 public comments were received. These comments generally fell into two major groups. One major group contained approximately 1,000 comments from private citizens, citizen associations or committees, and local airport authorities, of which approximately 960 comments were identical form letters submitted from the Los Angeles, Calif., area. The other major group included comments from aviation trade associations, aircraft manufacturers, and aircraft operators. With few exceptions, both major groups of commentators generally concluded that the standards in the notice should be changed, but for directly opposite reasons, the first group contending that Congress intended greater reductions in noise levels than those proposed, and the second group contending that the statutory requirement to prescribe technologically practicable and economically reasonable noise standards could only be met with noise levels higher than those proposed.

III. *Comments from individual citizens.* The above-mentioned 960 form letters stated that the noise standards should be "based on the technology available instead of that which would be the most advantageous to the airlines." The FAA agrees that available technology must be applied in the reduction of aircraft noise. The noise standards in this amendment are intended to accomplish this result consistent with the requirement in section 611(b)(4) that the Administrator must consider whether the standards are economically reasonable and technically practicable.

One person stated that proposed Part 36 "does not adequately reflect the will of Congress in enacting Public Law 90-411, especially in the area of takeoff noise. In 1966-67, certain realistic standards for noise limits were set. These limits have undergone various changes so that in the new Part 36 the prescribed limits represent a regression rather than progress in noise control." While noise values discussed in 1966 and 1967 were the best prediction then available concerning noise limits that might be reasonably achievable after the passage of a public law authorizing noise standards in type certification, the subsequent studies and research accomplished during and after the period of the promulgation of Public Law 90-411, and particularly the FAA's review of the greatly expanded economic studies conducted in response to Notice 69-1 have indicated that the noise levels in Appendix C of this amendment represent appropriate noise reductions under the statutory requirement that the Administrator must consider the economic reasonableness and technological practicability of the rule. For this same reason, it would not be appropriate, at this time, to require compliance with the prescribed noise levels at the takeoff measuring point suggested by this commentator, namely 3 statute miles. However, as technology makes further reasonable noise reductions possible, the FAA will act to insure that the lowest reasonable noise levels are achieved at the noise measurement points in this amendment. The commentator stated that the terms of the notice would not "bring about a reduction of aircraft noise in established communities, as was the intent of Congress." In fact, the noise levels for new type designs in this amendment are substantially lower than those associated with the current fleet of jet aircraft.

The commentator further stated that the takeoff test conditions in the notice prohibit the operators of new aircraft from using operating procedures that have heretofore been successful in minimizing noise over established residential areas. The FAA has not determined whether a minimum takeoff profile should be proposed in the form of operating regulations. However, pending the issuance of such operating regulations, the takeoff test conditions in this amendment, being type certification conditions only, do not in any way affect the operation of aircraft at airports.

One commentator stated that he assumed that the notice was intended to protect the public from adverse physiological and psychological effects, and that a noise envelope accomplishing this must be placed within airport boundaries. The FAA agrees that protection of the public from the adverse effects of aircraft noise, by controlling the noise source, must be achieved by regulation consistent with the statutory obligation, on the part of the Administrator, to consider whether the regulations are economically reasonable, technologically practicable, and appropriate for the type of aircraft to which they apply. The FAA noise abatement regulatory program is intended to accomplish this objective with respect to the current state of the art. Further noise reductions will be required as the technology of noise abatement progresses.

One commentator stated that the noise levels should be expressed as "1-pound pressure." The FAA believes that its chosen unit of noise measurement (effective perceived noise level in decibels) is far superior to the measurement of sound pressures alone. The commentator requested that the rule be extended to other classes of aircraft. The FAA agrees that a more complete solution of the aircraft noise problem requires that other classes of aircraft be considered for future rulemaking, and intends to do so as more fully discussed below.

Several comments requested that sonic boom protection be assured. While not a part of this rulemaking action, study of the sonic boom problem is continuing so that appropriate action can be taken specifically in that area.

One comment expressed concern that these noise standards may be a "two-edged sword" that may conflict with safety in operation at airports. The question of compatibility between noise and airworthiness standards has been of primary concern to the FAA throughout its noise abatement activities, and particularly in the development of the standards in this amendment. This amendment is drafted (see section 36.3) to ensure that the airplane meets the applicable airworthiness requirements under all conditions in which noise compliance is

shown, and that all procedures for showing noise compliance and all noise abatement information developed for the flight crew are consistent with the applicable airworthiness regulations. This amendment is thus drafted to ensure that the noise standards do not amend any airworthiness standard but, rather, provide an entirely separate source of type certification standards that must, in all cases, be compatible with the applicable airworthiness standards.

One comment stated that the FAA should limit the noise levels to those that do not exceed industrial health standards, vehicle emission standards, construction welfare standards, or commercial activities standards, and the FAA should permit local standards to prevail if they are more stringent than FAA standards. It is agreed that the ultimate objective of aircraft noise abatement is the achievement of aircraft noise levels similar to, or lower than, those of other industrial operations. The FAA believes that this objective is to a significant degree achieved by this amendment at the measuring points prescribed in Appendix C (see, for example, U.S. Department of Labor occupational noise exposure standards prescribed at 34 F.R. 7948 on May 20, 1969). However, it is recognized that certain locally desired noise levels may not be achievable within the constraints of 49 U.S.C. 1431 which requires that economic reasonableness and technological practicability be considered in the issuance of noise standards by the FAA. This being the case, the FAA, in response to the Griggs decision (see above), recognizes the right of State or local public agencies, as the proprietors of airports, to issue nondiscriminatory restrictions with respect to the permissible level of noise that can be created by aircraft using their airports. However, the FAA does not recognize any right of any State or local government agency that is not an airport proprietor to issue any regulation controlling the flight of aircraft for noise purposes. The relationship between Public Law 90-411 (49 U.S.C. 1431) and local government initiatives was specifically discussed as follows in Senate Report 1353:

> The courts have held that the Federal Government presently preempts the field of noise regulation insofar as it involves controlling the flight of aircraft. Local noise control legislation limiting the permissible noise level of all overflying aircraft has recently been struck down because it conflicted with Federal regulation of air traffic. American Airlines v. Town of Hempstead, 272 F. Supp. 226 (U.S.D.C., E.D., N.Y., 1966). The court said, at 231, "The legislation operates in an area committed to Federal care, and noise limiting rules operating as do those of the ordinance must come from a Federal source." H.R. 3400 would merely expand the Federal Government's role in a field already preempted. It would not change this preemption. State and local governments will remain unable to use their police powers to control aircraft noise by regulating the flight of aircraft.
>
> However, the proposed legislation will not affect the rights of a State or local public agency, as the proprietor of an airport, from issuing regulations or establishing requirements as to the permissible level of noise which can be created by aircraft using the airport. Airport owners acting as proprietors can presently deny the use of their airports to aircraft on the basis of noise considerations so long as such exclusion is nondiscriminatory.
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> Just as an airport owner is responsible for deciding how long the runways will be, so is the owner responsible for obtaining noise easements necessary to permit the landing and takeoff of the aircraft. The Federal Government is in no position to require an airport to accept service by larger aircraft and, for that purpose, to obtain longer runways. Likewise, the Federal Government is in no position to require an airport to accept service by noiser aircraft, and for that purpose to obtain additional noise easements. The issue is the service desired by the airport owner and the steps it is willing to take to obtain the service. In dealing with this issue, the Federal Government should not substitute its judgment for that of the States or elements of local government who, for the most part, own and operate our Nation's airports. The proposed legislation is not designed to do this and will not prevent airport proprietors from excluding any aircraft on the basis of noise considerations.

One comment suggested that the FAA consider the use of certain sound-suppressing materials for buildings. While the use of such materials is encouraged, the FAA does not have authority to regulate building construction practices around airports, and this amendment does not involve such regulation.

Other comments from individual citizens presented views similar to those discussed above.

IV. *Comments from citizens associations and committees.* One citizens committee submitted comments identical to the 960 form letters from individuals requesting that the use of available noise reduction technology should be required by the rule. As stated above, this amendment initiates a regulatory program that is intended to insure the maximum noise reduction that is consistent with the statutory requirement to consider economic reasonableness and technological practicability.

One citizens association submitted the results of a noise study indicating that the introduction of commercial passenger traffic to their local airport would have large costs in their community and that the noise limits in the notice would not be acceptable in their community. Noise limits of 90 to 95 EPNdB were requested. The FAA is convinced after thorough study that the current state of the art in the field of aircraft noise reduction simply does not allow the attainment of the requested noise levels, for the larger aircraft, consistent with the statutory requirement that economic reasonableness and technological practicability be considered by the Administrator in issuing noise abatement regulations. Further, the judicial decisions and the legislative history of Public Law 90-411 have made it clear that the Federal Government should not substitute its judgment for that of the airport operator in determining the service desired by the airport operator or the steps that the responsible airport operator is willing to take to obtain the service, and that the Federal Government should recognize the airport operator's right to issue regulations or establish requirements as to the permissible level of noise which can be created by aircraft using the airport (see Senate Report 1353). However, it should be pointed out that this amendment requires that takeoff noise levels may not exceed 93 EPNdB before trade-off, for aircraft with maximum weights of 75,000 pounds or less. The commentator also stated that the proposed rules do not account for tones such as high pitched whines. To the contrary, as stated in the notice, the means of measurement, using the concept of effective perceived noise level (EPNL) in units of EPNdB, was developed to specifically account for the effects of tones, among other factors, in order to evaluate the qualities of aircraft noise that are particularly offensive to persons on the ground. One comment consisted of an agenda for a meeting of a sound abatement coordinating committee that illustrated the extent of community concern with respect to ameliorating the effects of aircraft noise in the community. The FAA encourages affected airport communities to make their needs known to the responsible airport authorities, and is committed to insuring that the aircraft that will use the airports incorporate all noise abatement design features that technology makes available and economically reasonable.

V. *Comments from State and local authorities (including airport authorities).* A comment from one airport commission recognized that the notice represents "no more than first steps toward an ambitious goal," and concluded that, in issuing noise standards, the FAA should take full cognizance of the views of the airport neighbors, as well as the views of the aviation industry. The FAA agrees and has fully reviewed each of the many comments received from those members of the public that are directly affected by aircraft noise. The public docket has been extremely valuable in defining the magnitude of the airport noise problem that remains to be solved. These public comments have greatly assisted the FAA in determining, after analysis of all comments, that the many and substantial costs to be imposed on the air transportation industry by this amendment are reasonable and appropriate.

The commentator also submitted comments and analyses of the proposed rules prepared by a university professor. These comments make the following points: The commentator states that the views of airport neighbors were not taken into account. As stated above, the FAA has reviewed all comments from this segment of the public and has found them useful and informative. The commentator stated that the proposed levels are not adequate because they are not socially acceptable. Under the above-mentioned statutory constraints, socially acceptable noise levels can only be required insofar as they involve economically reasonable burdens on the aircraft industry and are technologically practicable. The commentator stated that

the proposed regulations would allow aircraft to be noisier than present aircraft. To the contrary, the FAA believes that the noise values in Appendix C of this amendment represent actual noise levels significantly lower than those now generated by transport category or turbojet powered airplanes. The commentator stated that present airplanes should also be regulated. The FAA agrees, is now studying retrofit standards, and will issue such standards as proposals for public comment at the earliest possible time. Pending the development of retrofit standards, § 21.93 (b) provides that, for transport category or turbojet powered airplanes already type certificated (i.e., the entire current U.S. jet fleet) all changes that may increase the noise levels created by those airplanes are "acoustical changes" in type design. As such, these changes would require the airplane to be substantiated under, and meet, Part 36 as applicable to "acoustical changes" in type design (see § 36.1(c)). This feature will ensure that no further escalation of noise can occur in the current U.S. fleet of jet aircraft pending the issuance of retrofit requirements. The commentator stated that the noise values in the proposal, if issued as final rules, "will be hardened for all time and will never be improved." To the contrary, the FAA is firmly committed to lowering the prescribed noise limits as fast as technology reasonably permits. This will not only be done during type certification, but also after certification in the form of retrofit requirements applying to aircraft operators, where appropriate and economically reasonable.

The commentator stated that noise limits should not be related to airplane weights, since "it is the volume of noise produced that is critical, not the machine that makes it." The FAA agrees that weight is not related to the social or subjective acceptability of noise. However, weight is directly related to the amount of power or thrust needed by the airplane, and this factor is directly related to the amount of noise reduction that can be required consistent with economic reasonableness. This amendment must reflect this fact. The commentator stated that the takeoff, sideline, and approach measuring points are inadequate since the airplane generates noise during most of the takeoff and landing paths. The FAA believes that the prescribed measuring points in fact measure the capability of the aircraft to achieve maximum reasonable noise reductions at points representative of frequently occurring distances between the aircraft and the airport neighborhoods. This comment appears to be related to the commentator's statement that the airplane should not exceed certain noise limits at any point along the takeoff and approach paths "where there are inhabited residences." As stated above, the actual noise generated at a given airport in operation is not a question for type certification, but involves the right of airport proprietors to limit the permissible levels of noise that can be created by aircraft using the airport. If further noise reduction must be achieved at a given airport, the judicial decisions and the legislative history of Public Law 90-411 have made it clear that this is a matter for the airport proprietor.

The commentator objected to the noise prediction allowance and the trade-off provisions of proposed Appendix C. For reasons discussed in connection with the comments from the aircraft manufacturers, the noise prediction allowance is eliminated under this amendment. However, the trade-off feature is maintained since the total noise exposure created by an airplane is related to the noise transmitted to all three measuring points (sideline, approach, and takeoff). It would, therefore, not be rational to deny a type certificate to an aircraft that only slightly exceeds the required noise levels at one or two points if the exceedances can, in fact, be made up or offset at the remaining measuring point(s), so that the net result is an aircraft whose total noise exposure is no worse than that of an aircraft that barely met the requirements at all three measuring points. The commentator stated that the proposed rules do not insure that a noise approved airplane will be operated in the same manner as it was operated to obtain the approval. This comment is correct. Further, as stated above, the FAA has not determined whether a minimum takeoff profile should be proposed in the form of an operating rule. The commentator stated that any aircraft, pilots, or airlines that continually violate the standards met by the prototype aircraft should lose their certificates.

With respect to aircraft that no longer conform to the noise approved type design, the FAA would consider action against the airworthiness certificate as in the case of any nonconformity with the type design. With respect to pilots and air carriers, the FAA has not ruled out the possibility of certificate sanctions related to noise abatement regulations. However, such action is not contemplated based on the type certification test procedures since they do not, by themselves, regulate aircraft operators. The commentator stated that the proposals did not apply to takeoff and landing noise associated with supersonic aircraft (apart from sonic boom). The FAA agrees that civil supersonic airplanes should be regulated for takeoff and landing noise purposes (in addition to sonic boom) and is in the process of determining what standards will allow the maximum use of available noise reduction technology for such aircraft consistent with the statutory requirement that economic reasonableness be considered. This is more fully discussed below.

One comment from a city manager stated, in addition to comments similar to those treated above, that the FAA should "take a more militant stand in favor of the general public and opposed to the private monetary interests of airlines and aircraft manufacturers." It should be emphasized that the FAA does not intend to "favor" or "oppose" any segment of the public in its noise abatement activities. Rather, the FAA intends to impartially administer the language of 49 U.S.C. 1431 in the light of the pertinent statements of congressional intent concerning the public law, such as the statement in Senate Report 1353 that "a completely quiet airplane will not be developed within the foreseeable future. However, with the technological and regulatory means now at hand, it is possible to reduce both the level and the impact of aircraft noise. Within the limits of technology and economic feasibility, it is the view of the committee that the Federal Government must assure that the potential reductions are in fact realized." The FAA intends to insure that its noise abatement regulatory program requires aircraft manufacturers to achieve the greatest noise reductions that are consistent with the economically reasonable limits of noise reduction technology.

Other State and local authorities submitted comments similar to those discussed above, and made the following additional points: One comment stated that the proposed regulation "should be in terms of noise exposure to residential uses with grants withheld if an airport has not made all residential areas with greater exposure compatible with the airport." While the FAA agrees that the airport proprietor is responsible for assuring compatibility of the airport with neighboring land uses, this amendment does not involve the grant or withholding of any funds, but rather is limited to prescribing design standards that must be met by aircraft manufacturers, for noise abatement purposes, as a condition to FAA approval of their products. The commentator also stated that the proposed regulation should not permit noncompliance by manufacturers for economic reasons. Under 49 U.S.C. 1431, economic reasonableness and technological practicability must be considered by the Administrator in determining the noise limits that must be complied with.

One comment recommended that the FAA should "avoid the current practice" under which pilots fly at full power up to the measuring device, reduce power over the measuring device, and then reapply full power when out of range of the measuring device. While these amendments do not regulate the operation of airplanes, it should be noted that the conditions of noise measurement under this amendment are intended to be sufficiently conservative to ensure that the noise values demonstrated during certification can be duplicated in operation under relatively high power or thrust conditions, so that noise levels demonstrated during type certification can be safely achieved by flight crews without the need for further power reductions over the measuring devices. Thus, these amendments require that no power or thrust reductions may go below that power or thrust that will provide level flight with one engine inoperative, or below that power or thrust that will maintain a climb gradient of at least 4 percent, whichever power or thrust is

greater. In addition, takeoff power or thrust is required, during the type certification tests, from the start of the takeoff to the point at which a substantial altitude above the runway is reached. These features of the type certification noise test should minimize the future incentive for flight crews to make large power reductions to satisfy airport noise limitations. This should insure that the noise levels obtained during type certification can be used as dependable guides to airport planning at the local level.

One comment from a State aeronautics department stated that no compromise with 100 percent control of aircraft noise should be made except compromises made in the interest of safety. While the FAA agrees that safety must not be adversely affected by noise abatement actions, it should be noted that 49 U.S.C. 1431 directs the FAA to consider economic reasonableness and technological practicability, in addition to safety, in the issuance of noise abatement regulations.

One comment from the department of airports of a major city stated that more severe standards are necessary and particularly that the lateral noise values allowed by the proposed standards would eventually force the acquisition of an additional block of homes paralleling one runway. FAA studies indicate that the lateral noise levels allowed by this amendment represent a substantial improvement when compared with existing airplanes of the same weight. Further noise reductions will be required by the FAA as noise reduction technology progresses. In any case, responsibility for assuring compatibility with land uses around the airport, such as by acquiring additional land, rests with the airport proprietor.

One comment representing the airport operators contained several of the points discussed above, and also made the following suggestions for improving the regulation: The commentator stated that a noise limited weight should be established that is different from the airworthiness limited weight and that the FAA should permit the use of either weight depending on the noise sensitivity of the particular airport. While the FAA has considered such an approach as a possibility, it is now believed that the noise limited weights should be general operating limitations since: (1) A requirement for compliance with noise limits at low weights only would reduce industry incentive to achieve maximum reasonable noise reductions at the higher weights; and (2) the primary responsibility for ensuring that airport operation is compatible with surrounding neighborhoods rests with the airport operator.

However, the FAA realizes that an unjust situation could result if an aircraft, for which a noise limited weight less than the airworthiness maximum weight is established under § 36.1581(b), were required to operate at the lower weight from a particular airport or runway at which there is no noise problem whatsoever. In order to accommodate these infrequent situations and at the same time prohibit a general erosion of the noise protection provided by Part 36, the FAA will handle these situations on a case-by-case basis, under the exemption authority of section 601(c) of the Federal Aviation Act of 1958. Under that section, the Administrator would require proof that, in fact, there is no noise sensitivity associated with the particular airport or runway and that an exemption from the requirement to comply with operating limitations (see § 91.31 (a)) is in the public interest. When such proof is made, appropriate limitations would be placed in the exemption to ensure that the resulting operation does not affect any noise sensitive areas. The concurrence of the affected airport operator would, of course, be required as a condition to the granting of such an exemption. All of this would be accomplished under Part 11 of the Federal Aviation Regulations.

The commentator suggested that certification should be denied until additional noise reduction features have been incorporated in the airplane to permit additional noise reduction at the source. The FAA agrees with this concept and, as more fully discussed below, will not rely solely on the noise limits currently prescribed in Appendix C of Part 36 but will issue further regulations, during the type certification process, where necessary to insure that the maximum reasonable use of noise reduction technology is applied to the airplane. The commentator finally suggested that certification could be predicated on the use of higher thrust engines with no increase in maximum takeoff weight, so that lower noise levels would result. The FAA intends to insure that the noise limits applied to aircraft insure that all economically reasonable and technologically practicable design provisions are employed to reduce noise, including the use of power plants that provide the greatest noise reduction.

One comment from a State port authority stated that the standards in Part 36 should be at least as stringent as those informally proposed by the FAA in 1966, namely, 106 EPNdB for very large aircraft. Information submitted under the FAA's public rule making procedures indicates that the noise values being considered in 1966 could not be prescribed, for those same airplane weights, consistent with the statutory requirement that economic reasonableness be considered. After thorough review of comments submitted, the FAA believes that this amendment contains the lowest noise levels that are currently economically reasonable and technologically practicable for the very large aircraft mentioned by the commentator. However, as noise reduction technology develops, the FAA intends to ensure that the noise levels mentioned by the commentator, and lower noise levels, are achieved when the impact of such lower noise levels will be economically reasonable.

The commentator also stated that the noise measurement distances should be reduced in order to protect more residents. The objective of the noise limits specified at the measurement points in this amendment is to achieve all noise reduction that is economically reasonable and technologically practicable. Therefore, the measurement distances could not be shortened, consistent with the statutory requirement to consider technological practicability and economic reasonableness, unless the noise levels were correspondingly raised over those contained in this amendment. Further, while no single set of measuring points can represent all airport/community situations, it is believed that the measurement points in this amendment are no less typical than those suggested by the commentator.

The commentator cited Department of Transportation and NASA studies concerning the progress that can and must be made in the field of aircraft noise reduction, and stated that "only by reducing to a minimum the geographic areas affected by maximum aircraft noise levels can a compatible land use program be manageable." The FAA recognizes that much remains to be done. This amendment is but the first step, under 49 U.S.C. 1431, in a noise abatement regulatory program whose primary objective is that cited by the commentator, namely, the greatest protection of the greatest number of airport neighbors from aircraft noise by reducing affected noise sensitive areas to the absolute minimum consistent with the statutory requirement that the FAA must consider economic reasonableness and technological practicability relative to the affected aircraft.

The port authorities of two major metropolitan areas submitted comments containing many of the points discussed above, and in addition submitted the following comments: One commentator stated that a reasonable portion of the increased efficiency of new engine designs should be required to be absorbed in noise abatement. The FAA agrees. It is the intent of the FAA noise abatement regulatory program to insure that each new technological advance contributes its reasonable share to the ultimate solution of the noise problem. Both commentators mentioned that airport operators may have difficulty in monitoring and enforcing noise standards determined as prescribed in this amendment, and one comment stated that the FAA should monitor and enforce, in operation, the noise levels prescribed in this amendment. It should be emphasized that nothing in this amendment is intended to substitute Federal judgment for that of the airport proprietor in the determination of the noise levels, noise measurement, or noise evaluation techniques that are most responsive to the particular and unique noise problems facing each airport proprietor.

VI. *Comments from aviation trade associations (other than aircraft manufacturers and operators).* One comment stated that airline pilots are concerned about disparities between certification

performance and actual operational performance "under line conditions." The commentator stated that while the certification procedures are acceptable for the purposes of noise certification testing, it should be made clear that the flight procedures in the NPRM are not necessarily representative of airline operating techniques nor will they necessarily produce the minimum amount of total noise exposure on the ground. As stated above, the FAA has not determined whether a minimum takeoff profile should be proposed in the form of an operating rule. Consistent with safety, however, the FAA agrees that the airport proprietor should be permitted to issue any nondiscriminatory restrictions on the use of his airport for noise abatement purposes. Nothing in this amendment, or in any later promulgated operating rule, will affect in any way the airport proprietor's authority to determine the noise sensitivity of his neighbors and restrict the use of his airport accordingly. Consistent with safety, and with this recognized authority in the airport proprietor, the procedures in Part 36 serve the following necessary purposes: First, by prescribing full power or thrust to a substantial altitude and substantial power or thrust after cutback of power or thrust, together with a speed of at least V_2+10 knots, the type certification procedures should insure that the resulting demonstrated noise levels are conservative so that the public will not be misled and so that flight crews can achieve these values with safe reserves of power and speed. Secondly, by standardizing the measurement conditions, the type certification procedures insure that the resulting noise values have the same meaning for all aircraft of the same class so that valid comparisons between those aircraft can be made.

The commentator stated that noise measurements made for aircraft following an approach angle of 3° with a tolerance of ±0.5° must be corrected for the actual position in respect to the glide slope at the time the measurement was taken. The FAA believes that the intent of this comment is accounted for since section A36.3(c)(2) of Appendix A provides that the EPNL values obtained from the measured approach path must be corrected to the reference flight path (i.e., approach path of 3° and aircraft height of 370 feet vertically above the approach measurement location).

The commentator stated that the rule should provide that all engines must be operating at the appropriate approach power or thrust settings for the specific procedure. The FAA agrees and has furnished specific approach test conditions, including power or thrust settings, in § C36.9.

The commentator stated that the minimum altitude for power cutback in § C36.7(a) should be raised to 1,500 feet. This comment is not accepted since the altitudes prescribed in this part are believed to be adequate for safety, and will allow a reasonable flexibility in the use of power in meeting the prescribed noise levels.

The commentator stated that the minimum speed for compliance with the takeoff test should be no less than "V_2+20 knots or the maneuvering speed, whichever is greater." The FAA believes that the speed V_2+10 knots is an appropriate and safe minimum speed for the takeoff noise test and that no higher speed, such as V_2+20 knots or the maneuvering speed, is necessary for a valid and conservative demonstration of takeoff noise.

The commentator stated that § C36.7 should provide that flap settings must be consistent with those used during normal operations. The FAA believes that a constant airplane configuration is necessary throughout the takeoff noise test (C36.7(d)), as more fully discussed below. The applicant may select this configuration so that it is not inconsistent with normal operations.

One comment from an association representing the flight engineers stated that the notice of proposed rule making was acceptable as published.

One comment from a technical society made several editorial suggestions for improving Appendix B as proposed. Those comments are adopted. The comment also stated that the concept of Effective Perceived Noise Level (EPNL) is an imperfect one and therefore suggested that the regulations should provide for an appeal to a panel or jury of listeners for comparison with known noise references. The FAA agrees that the concept of EPNL is imperfect and should be continuously refined to more adequately measure the qualities of aircraft noise that cause subjective annoyance. However, this comment is not accepted since (1) no jury concept has been shown to be compatible with equal regulation of all applicants according to predictable well defined guidelines, and (2) it is believed that the concept of EPNL, as used in this amendment, is sufficiently precise, and responsive to the annoyance factors in aircraft noise, to provide a fair basis for insuring that all noise reduction technology that is currently economically reasonable and technologically practicable is applied to the airplane, and to provide that all similar type designs are similarly regulated.

VII. *Comments from aircraft manufacturers and air carriers.* Comments were received from an individual air carrier and from associations representing aircraft manufacturers and air carriers.

The comment from the individual air carrier made the following suggestions: The commentator stated that the flap position used for takeoff and initial climb should be the largest deflection approved for takeoff at maximum weight, and that flap deflection should not be reduced before reaching the takeoff measuring point. The commentator also stated that the initial climb speed should not be less than V_2+10 knots or stall speed plus 40 knots, whichever is greater, and that no deceleration should be permitted in the initial climb speed from liftoff to the takeoff measuring point. The FAA agrees that a takeoff test airspeed of V_2+10 knots is adequate for safety and will not preclude a valid noise test. This comment is therefore accepted with respect to the speed V_2+10 knots. However, the FAA also believes that by requiring a constant takeoff configuration and takeoff power or thrust from the start of the takeoff to the point at which a substantial altitude is reached, Part 36 insures that the takeoff noise test is fully compatible with safe operating procedures. The commentator also stated that the approach speed should not be less than 130 percent of the stall speed plus 10 knots and should be essentially constant during the approach. The FAA agrees. As more fully discussed below, this was the intent of the term "reference airspeed" as used in the notice. Part 36 insures that the approach noise test is fully compatible with safe operating procedures by providing that the test must be conducted with the aircraft stabilized and following the prescribed glide angle at proper approach power or thrust for maximum allowable landing flap settings, with an approach speed of 1.30 V_s+10 knots over the approach noise measuring point (see § C36.9). The commentator stated that the noise type certification procedures should be "compatible with good and practicable operating practices." The FAA agrees, and believes that Part 36 contains procedures that can be duplicated practicably and safely in normal operations. The commentator further stated that all references to operating procedures should be deleted from the rule, and that the flight manual should contain performance data instead. Apparently, the commentator, like several other persons who commented, assumed that operating procedures established during noise type certification and placed in the airplane flight manual were intended to be mandatory procedures for operators. This is not the case. The data and procedures developed under Part 36 are placed in the airplane flight manual as operating procedures and performance information only. In order to prevent further confusion, § 36.1581(a) provides that no operating limitations may be furnished under that section (except as provided in § 36.1581(b)). However, as stated above, operating rules may later be proposed. Such rules would be operating regulations amending Part 91 or 121 rather than airplane flight manual operating limitations for noise abatement purposes.

The comments representing the aircraft manufacturers and air carriers contained analyses of the economic impact of the proposed rules, together with detailed recommendations for changing the regulations. Both commentators concluded that the proposed standards were so severe in their effects that the proposals violated the statutory requirement that economic reasonableness be considered. In addition, the comment representing the aircraft manufacturers stated that the notice of proposed rule

making was unacceptable, should be discarded, and should be replaced in its entirety with an alternative noise type certification regulation prepared by the association representing the manufacturers. Numerous changes were requested. However, in view of the large volume of detailed comments, only the most significant comments can be discussed herein.

The most significant changes requested by the aircraft manufacturers and air carriers are as follows: (1) It was requested that the noise prediction allowance be eliminated; (2) it was requested that the minimum altitude for reduction of power or thrust be lowered from 1,000 feet (as proposed) to 700 feet; (3) it was requested that the prescribed noise levels be relaxed, the air carrier comment requesting that the sliding scale of the noise levels with respect to aircraft weights be changed, and the manufacturer's comment stating that an increase of 2 EPNdB should be granted, across the board, particularly to allow a more relaxed requirement for airplanes with high maximum weights; (4) it was requested that growth airplanes be allowed to increase noise levels above the "parent" airplane, and at least 2 EPNdB higher than the originally applied levels of Appendix C, provided that the growth airplane meets the applicable higher noise ceiling criteria; (5) it was requested that the power or thrust level required, after reduction of power or thrust during the takeoff test, be the power or thrust necessary to provide level flight in the event of engine failure, but not less than a climb equivalent of 4 percent (as opposed to 6 percent as proposed in the notice); (6) it was requested that the tradeoff provision be relaxed to provide for a maximum of 3 EPNdB at any one measuring point, with a total of 5 EPNdB to be offset at the remaining measuring points (as compared with the proposed values of 3 EPNdB and 2 EPNdB, respectively); (7) it was requested that the distance for measuring sideline noise be extended from 0.25 nautical mile to 0.35 nautical mile; (8) it was requested that the FAA issue all of the proposed regulatory material concerning the measurement and evaluation of noise (proposed as Appendices A and B respectively) in the form of nonregulatory Advisory Circulars; (9) it was requested that the FAA eliminate its intention to require each aircraft to be designed to be as quiet as practical during type certification, eliminate the announced intent to achieve a low noise level or "floor" of 80 EPNdB and replace this approach with the concept of periodic reviews with industry "aimed at future noise reductions"; and finally, (10) it was stated that the initial application to type designs for which application was received prior to the effective date of Part 36 is not acceptable in principle.

A large volume of detailed economic data was submitted by the aircraft manufacturers and operators. This information was submitted in order to permit the FAA to establish the best possible understanding of the economic implications of the proposed rule, in accordance with the requirement in section 611(b)(4) of Public Law 90-411 that the Administrator "shall * * * consider whether any proposed standard, rule, or regulation is economically reasonable, technologically practicable, and appropriate for the particular type of aircraft * * * to which it will apply." The submitted data represented in detail the economic requirements of the air carriers in the 1972 to 1975 time period, and covered a broad spectrum of airplane designs. For these aircraft, the data described the economic impact of the proposed rules with respect to aircraft design selection and performance, propulsion requirements, the complex interrelations between aerodynamics, acoustics, and weight, and the resultant economic effects on payload, fuel requirements, runway requirements, and in particular the impact of these factors on route structures used by the air carriers, from the shortest domestic routes to the longest intercontinental routes. The analysis included airplane operating costs and the impact of these costs on airline system economics.

A thorough review of all data submitted has convinced the FAA that the current state of the art of noise reduction, as related to the impact of noise reduction on the economic life of affected aircraft, requires that certain modifications in the proposed rules be granted at this time for airplanes with more than three turbojet engines, because of the weight and design mission requirements of those airplanes. These modifications could not be withheld by the FAA consistent with the statutory requirement to consider the economic reasonableness and technological practicability of the rules. In addition, certain changes are made, for all airplanes, that should not adversely effect the noise levels created by those airplanes.

First, it is believed that no adverse effect on the validity of the takeoff noise test will result if the requested change in power required after cutback is granted. This is true since the power necessary for a 4 percent climb gradient without failure of one engine, or a zero climb gradient after such failure, is still a high enough power setting so that the resulting noise levels are conservative and can be duplicated easily and safely in operation. This change is, therefore, made in § C36.7 of Appendix C. This change is an economically necessary relaxation for airplanes having more than three turbojet engines. For other airplanes, the requirement to maintain at least a zero climb gradient is sufficiently severe so that no real relaxation results.

Secondly, since it is not a relaxation, it is believed that the requested elimination of the proposed noise prediction allowance can be accomplished with no adverse effect on noise levels. It is not understood why the industry regarded the noise prediction allowance as a restriction since the allowance provided for exceedance privileges, above the normal noise limits, if certain conditions were met. This amendment eliminates the allowance for noise prediction. Under this amendment, no provision is permitted for exceeding the values obtained after applying the trade-off exceedance values. Thirdly, a limited relaxation is made in the definition of "major change" in type design in order to provide a clear noise limit within which growth of the airplane may proceed without the need for meeting amendments to Part 36 that are issued after the airplane is first type certificated. The notice of proposed rule making stated that any change that may increase the noise of the airplane would be classified as a "major change." The FAA believes that this approach is still valid for airplanes that have not fully complied with Appendix C of Part 36, including all aircraft not type certificated under Part 36, in order to insure that the escalation of aircraft noise has been stopped by this amendment. For these aircraft, no change from the notice is appropriate. However, the FAA recognizes that the aircraft manufacturer requires a firm noise limit within which growth can occur under the rules applicable to the original type certification under Part 36. The FAA believes that this degree of certainty can be given the manufacturer, consistent with the public interest, for aircraft for which compliance was shown with the noise limits of Appendix C as applicable to the date of application for the original type certification under Part 36. However, in no case should aircraft growth, that may make the aircraft noisier than the original limits prescribed in Appendix C, be permitted.

This amendment permits aircraft that are quieter than Appendix C requirements to grow up to the limits of Appendix C with respect to noise. This relaxation does not satisfy the aircraft manufacturer's request that room for growth be added above the proposed Appendix C values. However, the FAA believes that the approach discussed above provides a reasonable balance between the manufacturer's legitimate need for a certain and defined growth potential, and the public need for an orderly and progressive deescalation of aircraft noise. In short, §§ 21.93(b) and 36.1(c) will ensure that noise reduction technology sufficient to achieve Appendix C limits must be applied before further aircraft growth can occur. This applies to the entire fleet of transport and jet airplanes now extant. The FAA believes that this priority of values is necessary in order to prevent a continual erosion in aircraft noise. It should be pointed out that this aspect of the rule merely limits future noise escalation and is no substitute for supplementary retrofit requirements that will later be adopted to effect a positive reduction in the noise of the current fleet. Finally, while the notice designated these changes as noise related "major changes," this amendment redesignates them as "acoustical changes." This editorial change, plus the statement in § 21.93(b) that "acoustical changes" are so designated for the purpose of complying with Part 36 only, insure that no acoustical judgments will, in any way, alter the previously established criteria for determining whether

a change in type design is "minor" or "major" for airworthiness purposes. Nothing in this amendment affects the distinction between minor and major changes for airworthiness purposes or affects the procedural or substantive requirements applicable to either kind of change. The proposed amendment to § 21.115 is withdrawn in connection with this change.

With respect to the comment concerning application of Part 36 to aircraft for which type certification application was made prior to the effective date of the part, the FAA is in partial agreement. This amendment contains three departures from the notice with respect to type certification applications now pending. First, since there are not such applications pending with application dates between the date of publication of the notice and the publication date of Part 36, the proposal to require only the development of procedures and information to achieve the lowest reasonable noise level (in addition to compliance with the remaining applicable sections of Part 36) for aircraft not having high bypass ratio engines, is extended to cover all applications prior to the effective date of Part 36 (rather than only those applications prior to the publication date of the notice, as proposed). No actual regulatory change results and the effectivity of Part 36 is simplified by this change. If an application is filed between the publication and effective dates of Part 36 for such aircraft, further regulatory action will be considered. Secondly, it is believed that the requested increase in the trade-off provision, to allow a sum of exceedance of 5 EPNdB (rather than 3 EPNdB as proposed), and a greatest single exceedance of 3 EPNdB (rather than 2 EPNdB as proposed), is necessary to provide flexibility for aircraft with more than three engines that are already undergoing type certification, but will minimize the resultant noise increase by requiring, as the notice did, that all exceedances must be offset by reductions at other measuring points. This change appears in § C36.5(c). The remaining, and most significant, departure from the notice concerning the standards to be applied to aircraft currently undergoing type certification is as follows:

In § 36.201(b) of this amendment, consideration of acoustic requirements placed on aircraft for which application for the type certificate was made prior to January 1, 1967, is addressed. These aircraft, for example the Boeing 747, were in advanced phases of their design cycle prior to the establishment of definitive indications of probable certification noise levels. Regardless of the lack of definite acoustic design goals, the manufacturers of these aircraft have developed designs which represented the application of the most advanced acoustic technology available to them. As a consequence, these aircraft will produce noise levels considerably below those of present day aircraft even though the levels may not, in every way, comply with the requirements of Appendix C of this amendment. In recognition of the advances in the state of aircraft acoustic art demonstrated by these aircraft, the initial compliance with this amendment is to be considered on the basis of the use of acoustic techniques which will insure that these aircraft are as quiet as is technologically practical. However, the type certificate will contain an expiration period after which the manufacturer will be required to show compliance with the requirements of Appendix C. In this connection, § 36.201(d) provides that, for aircraft to which paragraph (b)(1) of that section applies, and that do not meet Appendix C, a duration period will be placed in the type certificate, upon the expiration of which the type certificate will be subject to suspension or modification (with full notice and appeal rights as contained in 49 U.S.C. 1429) unless the type design of later aircraft is modified to show compliance with Appendix C.

The request that nonregulatory Advisory Circulars be used for the procedures for measuring and evaluating noise cannot be accepted. Proper noise measurement and evaluation is necessary for a valid acoustical analysis of the airplane. Flexibility can be provided in the regulatory form by permitting the applicant to submit alternative procedures and show that those procedures are equivalent to those in Appendix A or B. As in the notice, Part 36 therefore contains noise measurement and evaluation standards in regulatory form (Appendices A and B).

It would also be inappropriate for the FAA to accept the request to eliminate the intent to achieve all reasonable noise reductions in each type certification program. The net result of this request, if adopted by the FAA, is that the noise limits prescribed in Appendix C would become guaranteed values that could be generated as a matter of right even if the FAA could reasonably determine, during the type certification process, that lower noise levels were economically reasonable. This result would be inconsistent with the FAA's commitment to achieve the greatest reasonable noise reductions as soon as technology permits. As stated in the notice, "the FAA cannot responsibly accept (the noise limits specified in Appendix C) as satisfactory where further noise reductions are available and reasonable. Where those further reductions are available, are economically reasonable, technologically practical, and appropriate to the particular type design, the FAA cannot ignore them by waiting until all type designs are expected to be quiet enough to permit lowering the noise ceiling for the entire class. By then, of course, any type designs that could have been substantially quieter would have been approved, and aircraft produced under them, without the realization of the actually available noise reductions. It is not believed that such a result is consistent with Public Law 90-411." However, the FAA recognizes that, since the technology of noise abatement is relatively new, the standards applied to the manufacturers should be precise and definite. In this connection, several comments requested that the general language in the notice ("economically reasonable * * *" (etc.)) should be replaced with specific regulatory language. In order to accept this reasonable request and also preserve the intent of the notice to achieve all reasonable noise reductions in each type certification program, the following approach will be adopted (for airplanes to which Appendix C applies):

Appendix C of Part 36, being the FAA's best estimate of the maximum reasonable noise reduction possible for given aircraft weights, will apply, for each aircraft weight, unless the FAA determines in a given type certification program that either Appendix C was originally unduly lenient, or developments in noise reduction technology render Appendix C unduly lenient for the particular type of aircraft. When this determination is made, the FAA will administer § 21.17(a)(1)(i) of the Federal Aviation Regulations (which in effect provides that the applicable type certification standards are not those in effect on the date of application for the type certificate where "otherwise prescribed by the Administrator") to issue precise and definite standards, with notice and public procedure, that will accomplish the intent of the general language proposed in the Notice to prevent the issuance of a type certificate for any aircraft for which available and reasonable noise reduction design practices have not been incorporated.

The FAA has determined that the request to remove the noise "floor" of 80 EPNdB from the regulatory language is reasonable and should be granted. This noise floor, not being currently achievable, could have no immediate legal effect. Further, it has become evident that the number 80 EPNdB might be misconstrued as being a value that is federally determined to be "acceptable" in a given local airport environment. In order to prevent this result, the reference to the noise "floor" is deleted from the final rule.

With respect to the requested increase in sideline measuring distance, the FAA concludes that, in combination with the prescribed noise limits, the proposed distance of 0.25 nautical mile would result in economic penalties that are unduly severe for airplanes having more than three turbojet engines. This defect could be cured by raising the noise limits at the proposed measurement point or by extending the measurement distance to a point at which the proposed noise limits become economically reasonable. While the effect of either approach would be the same with respect to the increase in sideline noise that would be permitted, the FAA believes that since the noise level numbers prescribed in the notice have been widely publicized for land planning purposes, any actions that may now be underway to achieve land use compatibility with those noise levels should be less affected by altering the measurement distance than by introducing new and unfamiliar noise levels.

Therefore, this amendment extends the required measuring distance from 0.25 nautical mile to 0.35 nautical mile for airplanes with more than three turbojet engines instead of raising the noise limits at the proposed sideline measuring distance. This distinction between the sideline measuring requirement for two- and three-engine turbojet airplanes and that for larger turbojet airplanes also reflects the fact that the larger airplanes will generally be operated out of larger airports only, while the smaller airplanes will be operated out of smaller airports as well as larger airports.

With respect to the requested lowering of the proposed takeoff noise test minimum altitude for power reduction to 700 feet, the FAA believes that a responsible assessment of the economic impact of the proposed altitude of 1,000 feet requires that this modification be granted for airplanes with more than three turbojet engines. This relaxation can be accomplished consistent with safe operating practices and will permit a valid and conservative takeoff noise test since a substantial power setting is required after power cutback.

With respect to the further requested raising of noise limits and the remaining requested relaxations, the FAA has evaluated the economic data submitted by the aircraft manufacturers and air carriers, and concludes that the requested relaxations in the regulation are not justified and that the claim of unreasonable economic impact cannot be responsibly accepted.

In particular, the submitted information does not justify any relaxation in the tradeoff, sideline, or takeoff power cutback altitude requirements for two- and three-engine turbojet airplanes. To the contrary, the submitted information clearly showed the economic effect of the proposed rules on the two- and three-engine airplanes to be far less than the impact on four-engine airplanes. In fact, certain industry comments indicated that further noise reductions may be economically reasonable and appropriate in the near future for the smaller turbojet engine powered airplanes. The FAA is undertaking study of the advisability of such additional rulemaking.

The commentator stated that the proposed rules were defective in that they will impose more economic burden on the largest, noisiest aircraft than on the smallest, less noisy aircraft. This result is, to some extent, inevitable. There is simply no way in which the escalation of noise can be effectively arrested without increasing the severity of noise suppression regulations as the noise generated by the aircraft increases.

The commentator states that it could not accept the basic measurement concept of Effective Perceived Noise Level (EPNL) unless all specific requested relaxations from the proposed rules (i.e., overall increase of .2 EPNdB, etc.) are granted. This amendment nevertheless adopts the concept of EPNL, with refinements, since (1) the basic validity of this unit of measurement does not depend on whether all requested relaxations are adopted; (2) the commentator's submitted data and analyses indicate that EPNL provides a sufficiently precise basis for predicting economic impact (although the FAA disagrees with certain of the data submitted); and (3) as discussed above, EPNL provides the best known basis for objectively measuring the qualities of aircraft noise that are most offensive to persons on the ground.

The notice proposed to permit the applicant to select a weight for takeoff noise compliance that is less than the maximum weight: *Provided*, That the lesser weight is furnished as an operating limitation. This allowance was not proposed for the landing weight used in complying with the approach noise requirements. This difference is not intended. Section 36.1581(b), therefore, permits any weights to be selected by the applicant for showing compliance with the takeoff and approach noise requirements provided that any selected weights that are less than the maximum weight or design landing weight must be furnished as operating limitations in the Airplane Flight Manual. This amendment also moves the approach test condition requirement from Appendix A to Appendix C, so that the conditions for approach and for takeoff would be specified together in the same appendix. This is done in new Section C36.9 of Appendix C. The notice proposed that the approach airspeed must be the "reference airspeed." The intent of this proposal was to require an airspeed that is highly typical of normal approach airspeeds, so that a realistic approach noise is generated. The speed 1.30V S+10 knots is such an airspeed and is therefore specified in Section C36.9(d). The following additional changes from the notice are made in the takeoff and approach test conditions. For the takeoff test, the reference to "takeoff flap" is changed to "takeoff configuration," since lift control devices other than flaps may be included. One comment stated that the applicant should be permitted to use any configuration schedule consistent with the airworthiness requirements and stated that some configuration change may be appropriate for minimizing community noise. The FAA does not know of any takeoff configuration schedule that will result in less total community noise than that resulting from maintaining a constant takeoff configuration throughout the takeoff noise test. The objective of the takeoff noise test is to determine the noise generated by the airplane under conditions representative of those actually necessary in operations if minimum total community noise exposure is to be achieved.

The commentators suggested several editorial changes which are adopted in whole or in part.

One comment stated that the word "turbojet" should be broadened to specify also "turbofan" engines. This change is not accepted since the word "turbojet" has been used without confusion, throughout the type certification regulations, to include "turbofan" engines.

The notice proposed that a statement of noise compliance be placed on the airworthiness certificate of aircraft type certificated under Part 36 for international recognition purposes. This proposal may have merit but final rulemaking thereon is withheld pending international agreement concerning the manner in which noise type certification is to be recorded for international recognition.

The proposed listing of specified noise sources and means of noise reduction is withdrawn since developments in noise reduction technology could rapidly obsolete such a listing. As stated above, however, the FAA will prescribe all additional regulations deemed necessary to ensure that all available and reasonable noise reduction technology is applied during type certification.

Since the general language proposed in the notice ("economically reasonable * * *" (etc.)) is deleted from this amendment (except for airplanes with high bypass ratio engines for which application was made prior to Jan. 1, 1967), a formal basis for providing more detailed regulations, at the applicant's request, will not be needed to a sufficient degree to justify retaining proposed § 21.16(c), which proposed special conditions for noise purposes if requested by the applicant. That proposal is therefore withdrawn.

With respect to foreign aircraft, the notice proposed to amend § 21.29 to provide that compliance with applicable aircraft noise regulations is to be certified by the foreign country as well as compliance with airworthiness regulations. This proposal is changed in this amendment to be consistent with § 21.29 as amended by Amendment 21-25 (published at 34 F.R. 14067 on Sept. 5, 1969). As pertinent here, these changes (1) limit the products to those that are to be imported into the United States, and (2) provide that all submitted listings must be presented in the English language. Other changes are made for consistency with the airworthiness procedures affecting import aircraft. There is no basis for distinguishing between airworthiness and aircraft noise standards in the acceptance by the FAA of statements of compliance by competent foreign authorities.

This rule, which is appropriate for the conventional subsonic aircraft, contains many concepts which are inappropriate for aircraft that are designed to operate vertically (VTOL), that have short takeoff and landing capabilities (STOL), and for aircraft that cruise at supersonic speeds (SST). Specifically, the vertically operating aircraft exhibit a unique acoustic characteristic since their propulsive thrust is generally obtained from large rotors, the short takeoff and landing aircraft will have acoustic characteristics related to the use of thrust to obtain lift, and the supersonic aircraft necessarily has a propulsive system which is sized for the high thrust requirements necessary to obtain supersonic speeds. Accordingly, the noise certification of the VTOL aircraft may require consideration of acoustic qualities which will need special psychoacoustic evaluation and the STOL aircraft may

require consideration of the unconventional thrust mode and operational environment. On the other hand, the extraordinarily high acceleration required by the SST in the transonic operation will necessarily produce performance capabilities at ground levels which have important implications concerning its noise characteristics. For instance, unusually high takeoff thrust will produce higher sideline noise levels in the vicinity of the airport; however, the resulting high gradient of climb will produce significantly lower noise levels over the communities underlying the takeoff flight path. Accordingly, the responsibility of local airport authorities to insure land use compatibility, as discussed in Senate Report 1353, must be exercised with particular care in the case of the SST because of the above mentioned unique acoustic characteristics. As a consequence of these considerations, this amendment excludes SST aircraft and does not contain specific additional regulations for VTOL and STOL aircraft since the acoustic technology associated with these classes of aircraft requires further study before the FAA can comply with the statutory requirement to consider whether the related noise standards are appropriate to the particular type of aircraft, are technologically practicable, and are economically reasonable. Separate rulemaking for these classes of aircraft is necessary to assure that all available and reasonable sources of noise reduction are realized as a basis for acoustically responsive land use planning by the responsible local airport proprietor. This rulemaking will be proposed for public comment at the earliest possible time.

In §§ A36.2 (c) and (d) and A36.5(a) of Appendix A of this amendment, the text and specifications contained in certain technical publications are incorporated by reference pursuant to 5 U.S.C 552(a)(1) and 1 CFR Part 20. Approval for those incorporations by reference was granted on September 25, 1969, by the Director of the Federal Register.

Pursuant to 49 U.S.C. 1431, the Federal Aviation Administration has consulted with the Secretary of Transportation, concerning all matters contained herein, prior to the adoption of this amendment.

Interested persons have been afforded an opportunity to participate in the making of these amendments. Due consideration has been given to all matter presented. In other respects, for the reasons stated in the preamble to the notice, the rule is adopted as prescribed herein.

This rule is intended to apply to airplanes now nearing the completion of the type certification process. However, a complex document of this type may require an unusually long processing time between the date it is filed with the FEDERAL REGISTER and its publication therein. For this reason, a copy of the rule is being provided by certified mail to each manufacturer of transport category and turbojet engine powered airplanes. Since it is the purpose of this rule to prevent, at the earliest possible date, any escalation of aircraft noise, I find that good cause exists for making the rule effective on December 1, 1969, even though that date may be less than 30 days after its date of publication in the FEDERAL REGISTER.

In consideration of the foregoing, Subchapter C of Chapter I of Title 14 of the Code of Federal Regulations is amended, effective December 1, 1969, as follows:

A. Part 21 of the Federal Aviation Regulations is amended as follows:

§ 21.17 [Amended]

1. Section 21.17(a) is amended by changing the word "§ 25.2" appearing in the introductory clause to the words "§§ 25.2 and 36.2."

2. Sections 21.21 (b) and (b)(1) are amended to read as follows:

§ 21.21 Issue of type certificate: Normal, utility, acrobatic, and transport category aircraft; aircraft engines; propellers.

* * * * *

(b) The applicant submits the type design, test reports, and computations necessary to show that the product to be certificated meets the applicable airworthiness and aircraft noise requirements of the Federal Aviation Regulations and any special conditions prescribed by the Administrator, and the Administrator finds—

(1) Upon examination of the type design, and after completing all tests and inspections, that the type design and the product meet the applicable aircraft noise requirements of the Federal Aviation Regulations, and further finds that they meet the applicable airworthiness requirements of the Federal Aviation Regulations or that any airworthiness provisions not complied with are compensated for by factors that provide an equivalent level of safety; and

* * * * *

3. Section 21.29 is amended to read as follows:

§ 21.29 Issue of type certificate: import products.

(a) A type certificate may be issued for a product that is manufactured in a foreign country with which the United States has an agreement for the acceptance of these products for export and import and that is to be imported into the United States if—

(1) The country in which the product was manufactured certifies that the product has been examined, tested, and found to meet—

(i) The applicable aircraft noise requirements of this subchapter as designated in § 21.17 or the applicable aircraft noise requirements of the country in which the product was manufactured and any other requirements the Administrator may prescribe to provide noise levels no greater than those provided by the applicable aircraft noise requirements of this subchapter as designated in § 21.17; and

(ii) The applicable airworthiness requirements of this subchapter as designated in § 21.17, or the applicable airworthiness requirements of the country in which the product was manuafctured and any other requirements the Administrator may prescribe to provide a level of safety equivalent to that provided by the applicable airworthiness requirements of this subchapter as designated in § 21.17;

(2) The applicant has submitted the technical data, concerning aircraft noise and airworthiness, respecting the product required by the Administrator; and

(3) The manuals, placards, listings, and instrument markings required by the applicable airworthiness (and noise, where applicable) requirements are presented in the English language.

(b) A product type certificated under this section is considered to be type certificated under the noise standards of Part 36 of the Federal Aviation Regulations where compliance therewith is certified under paragraph (a)(1)(i) of this section, and under the airworthiness standards of that part of the Federal Aviation Regulations with which compliance is certified under paragraph (a)(1)(ii) of this section or to which an equivalent level of safety is certified under paragraph (a)(1)(ii) of this section.

§ 21.31 [Amended]

4. Section 21.31(c) is amended by inserting the words "and noise characteristics (where applicable)" between the words "the airworthiness" and the words "of later products."

§ 21.33 [Amended]

5. Section 21.33(b)(1) is amended by adding the words "and aircraft noise" between the word "airworthiness" and the word "requirements."

6. Section 21.93 is amended to read as follows:

§ 21.93 Classification of changes in type design.

(a) In addition to changes in type design specified in paragraph (b) of this section, changes in type design are classified as minor and major. A "minor change" is one that has no appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product. All other changes are "major changes" (except as provided in paragraph (b) of this section).

(b) For the purpose of complying with Part 36 of this chapter only, any voluntary change in the type design of a transport category or turbojet engine powered airplane that may increase the noise levels created by the airplane is an "acoustical change" in addition to being a minor or major change as classified in paragraph (a) of this section.

§ 21.101 [Amended]

7. Section 21.101(a) is amended by changing the word "§ 25.2" appearing in the introductory clause to the words "§§ 25.2 and 36.2".

B. The following new Part 36 is added to the Federal Aviation Regulations:

PART 36—NOISE STANDARDS: AIRCRAFT TYPE CERTIFICATION

Subpart A—General

Subpart B—Noise Measurement and Evaluation

Subpart C—Noise Limits

Subpart D [Reserved]

Subpart E [Reserved]

Subpart F [Reserved]

Subpart G—Operating Information and Airplane Flight Manual

AUTHORITY: The provisions of this Part 36 issued under secs. 313(a), 601, 603, and 611 of the Federal Aviation Act of 1958; 49 U.S.C. 1354, 1421, 1423, and 1431 and sec. 6(c) of the Department of Transportation Act; 49 U.S.C. 1655(c).

Subpart A—General

§ 36.1 Applicability.

(a) This part prescribes noise standards for the issue of type certificates, and changes to those certificates, for subsonic transport category airplanes, and for subsonic turbojet powered airplanes regardless of category.

(b) Each person who applies under Part 21 of this chapter for a type certificate must show compliance with the applicable requirements of this part, in addition to the applicable airworthiness requirements of this chapter.

(c) Each person who applies under Part 21 of this chapter for approval of an acoustical change described in § 21.93 (b) of this chapter must show that the airplane meets the following requirements in addition to the applicable airworthiness requirements of this chapter:

(1) The noise limits prescribed in Appendix C of this part, for airplanes that can achieve those noise levels, or lower noise levels, prior to the change in type design.

(2) The noise levels created by the airplane prior to the change in type design, measured and evaluated as prescribed in Appendixes A and B of this part, for airplanes that cannot achieve the noise limits prescribed in Appendix C of this part prior to the change in type design.

§ 36.2 Special retroactive requirements.

(a) Notwithstanding § 21.17 of this chapter, and irrespective of the date of application, each applicant covered by § 36.201 (b)(1) and (c)(1), and § C36.5 (c) of this part who applies for a new type certificate, must show compliance with the applicable provisions of this part.

(b) Notwithstanding § 21.101(a) of this chapter, each person who applies for an acoustical change to a type design specified in § 21.93(b) of this chapter must show compliance with the applicable provisions of this part.

§ 36.3 Compatibility with airworthiness requirements.

It must be shown that the airplane meets the airworthiness regulations constituting the type certification basis of the airplane under all conditions in which compliance with this part is shown, and that all procedures used in complying with this part, and all procedures and information for the flight crew developed under this part, are consistent with the airworthiness regulations constituting the type certification basis of the airplane.

§ 36.5 Limitation of part.

Pursuant to 49 U.S.C. 1431(b)(4), the noise levels in this part have been determined to be as low as is economically reasonable, technologically practicable, and appropriate to the type of aircraft to which they apply. No determination is made, under this part, that these noise levels are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

Subpart B—Noise Measurement and Evaluation

§ 36.101 Noise measurement.

The noise generated by the airplane must be measured under Appendix A of this part or under an approved equivalent procedure.

§ 36.103 Noise evaluation.

Noise measurement information obtained under § 36.101 must be evaluated under Appendix B of this part or under an approved equivalent procedure.

Subpart C—Noise Limits

§ 36.201 Noise limits.

(a) Compliance with this section must be shown with noise levels measured and evaluated as prescribed in Subpart B of this part, and demonstrated at the measuring points prescribed in Appendix C of this part.

(b) For airplanes that have turbojet engines with bypass ratios of 2 or more and for which—

(1) Application was made before January 1, 1967, it must be shown that the noise levels of the airplane are no greater than those prescribed in Appendix C of this part, or are reduced to the lowest levels that are economically reasonable, technologically practicable, and appropriate to the particular type design; and

(2) Application was or is made on or after January 1, 1967, it must be shown that the noise levels of the airplane are no greater than those prescribed in Appendix C of this part.

(c) For airplanes that do not have turbojet engines with bypass ratios of 2 or more and for which—

(1) Application was made before December 1, 1969, it must be shown that the lowest noise levels, reasonably obtainable through the use of procedures and information developed for the flight crew under § 36.1501 are determined; and

(2) Application was or is made on or after December 1, 1969, it must be shown that the noise levels of the airplane are no greater than those prescribed in Appendix C of this part.

(d) For aircraft to which paragraph (b)(1) of this section applies and that do not meet Appendix C of this part, a time period will be placed on the type certificate. The type certificate will specify that, upon the expiration of this time period, the type certificate will be subject to suspension or modification under section 611 of the Federal Aviation Act of 1958 (49 U.S.C. 1431) unless the type design of aircraft produced under that type certificate on and after the expiration date is modified to show compliance with Appendix C. With respect to any possible suspensions or modifications under this paragraph, the certificate holder shall have the same notice and appeal rights as are contained in section 609 of the Federal Aviation Act of 1958 (49 U.S.C. 1429).

Subpart G—Operating Information and Airplane Flight Manual

§ 36.1501 Procedures and other information.

All procedures, any other information for the flight crew, that are employed for obtaining the noise reductions prescribed in this part must be developed. This must include noise levels achieved during type certification.

§ 36.1581 Airplane flight manual.

(a) The approved portion of the Airplane Flight Manual must contain procedures and other information approved under § 36.1501. Except as provided in paragraph (b) of this section, no operating limitations may be furnished under this section. The following statement must be furnished near the listed noise levels:

> No determination has been made by the Federal Aviation Administration that the noise levels in this manual are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

(b) If the weight used in meeting the takeoff or landing noise requirements of this part is less than the maximum weight or design landing weight, respectively, established under the applicable airworthiness requirements, those lesser weights must be furnished, as operating limitations, in the operating limitations section of the Airplane Flight Manual.

(Secs. 313(a), 601, 603, and 611 of the Federal Aviation Act of 1958, 49 U.S.C. 1354, 1421, 1423, and 1431, and sec. 6(c) of the Department of Transportation Act, 49 U.S.C. 1655(c))

Issued in Washington, D.C., on November 3, 1969.

J. H. SHAFFER,
Administrator.

APPENDIX A—AIRCRAFT NOISE MEASUREMENT UNDER § 36.101

Section A36.1 *Noise certification test and measurement conditions*—(a) *General.* This section prescribes the conditions under which noise type certification tests must be conducted and the measurement procedures that must be used to measure the noise made by the aircraft for which the test is conducted.

(b) *General test conditions.* (1) Tests to show compliance with established noise type certification levels must consist of a series of takeoffs and landings during which measurements must be taken at the measuring points defined in Appendix C of this part. The sideline noise measurements must also be made at symmetrical locations on each side of the runway. On each test takeoff, simultaneous measurements must be made at the sideline measuring points on both sides of the runway and also at the takeoff flyover measuring point. If the height of the ground at each measuring point differs from that of the nearest point on the runway by more than 20 feet, corrections must be made as defined in § A36.3(d) of this appendix.

(2) Locations for measuring noise from an aircraft in flight must be surrounded by relatively flat terrain having no excessive sound absorption characteristics such as might be caused by thick, matted, or tall grass, shrubs, or wooded areas. No obstructions which significantly influence the sound field from the aircraft may exist within a conical space above the measurement position, the cone being defined by an axis normal to the ground and by a half-angle 75° from this axis.

(3) The tests must be carried out under the following weather conditions:

(i) No rain or other precipitation.

(ii) Relative humidity not higher than 90 percent or lower than 30 percent.

(iii) Ambient temperature not above 86° F. and not below 41° F. at 10 meters above ground.

(iv) Airport reported wind not above 10 knots and crosswind component not above 5 knots at 10 meters above ground.

(v) No temperature inversion or anomalous wind conditions that would significantly affect the noise level of the aircraft when the noise is recorded at the measuring points defined in Appendix C of this part.

(c) *Aircraft testing procedures.* (1) The aircraft testing procedures and noise measurements must be conducted and processed in an approved manner to yield the noise evaluation measure designated as Effective Perceived Noise Level, EPNL, in units of EPNdB, as described in Appendix B of this part.

(2) The aircraft height and lateral position relative to the extended centerline of the runway must be determined by a method independent of normal flight instrumentation such as radar tracking, theodolite triangulation, or photographic scaling techniques to be approved by the FAA.

(3) The aircraft position along the flight path must be related to the noise recorded at the noise measurement locations by means of synchronizing signals. The position of the aircraft must be recorded relative to the runway from a point at least 4 nautical miles from threshold to touchdown during the approach and at least 6 nautical miles from the start of roll during the takeoff.

(4) The takeoff test may be conducted at a weight different from the maximum takeoff weight at which noise certification is requested if the necessary EPNL correction does not exceed 2 EPNdB. The approach test may be conducted at a weight different from the maximum landing weight at which noise certification is requested provided the necessary EPNL correction does not exceed 1 EPNdB. Approved data may be used to determine the variation of EPNL with weight for both takeoff and approach test conditions.

(5) The takeoff test must meet the conditions of § C36.7 of Appendix C of this part.

(6) The approach test must be conducted with the aircraft stabilized and following a $3° \pm 0.5°$ approach angle and must meet the conditions of § C36.9.

(d) *Measurements.* (1) Position and performance data required to make the corrections referred to in § A36.3(c) of this appendix must be automatically recorded at an approved sampling rate. Measuring equipment must be approved by the FAA.

(2) Position and performance data must be corrected, by the methods outlined in § A36.3(d) of this appendix to standard pressure at sea level, an ambient temperature of 77° F., a relative humidity of 70 percent, and zero wind.

(3) Acoustic data must be corrected by the methods of § A36.3(d) of this appendix to standard pressure at sea level, an ambient temperature of 77° F., and a relative humidity of 70 percent. Acoustic data corrections must also be made for a minimum distance of 370 feet between the aircraft's approach path and the approach measuring point, a takeoff path vertically above the flyover measuring point and for differences of more than 20 feet in elevation of measuring locations relative to the elevation of the nearest point of the runway.

(4) The airport tower or another facility must be approved for use as the location at which measurements of atmospheric parameters are representative of those conditions existing over the geographical area in which aircraft noise measurements are made. However, the surfac wind velocity and temperature must be measured near the microphone at the approach, sideline, and takeoff measurement locations, and the tests are not acceptable unless the conditions conform to § A36.1(b)(3) of this appendix.

(5) Enough sideline measurement stations must be used during tests so that the maximum sideline noise is clearly defined with respect to location and level.

Section A36.2 *Measurement of aircraft noise received on the ground*—(a) *General.* (1) These measurements provide the data for determining one-third octave band noise produced by aircraft during testing procedures, at specific observation stations, as a function of time.

(2) Methods for determination of the distance form the observation stations to the aircraft include theodolite triangulation techniques, scaling aircraft dimensions on photographs made as the aircraft flies directly over the measurement points, radar altimeters, and radar tracking systems. The method used must be approved.

(3) Sound pressure level data for noise type certification purposes must be obtained with approved acoustical equipment and measurement practices.

(b) *Measurement system.* (1) The acoustical measurement system must consist of approved equipment equivalent to the following:

(i) A microphone system with frequency response compatible with measurement and analysis system accuracy as stated in paragraph (c) of this section.

(ii) Tripods or similar microphone mountings that minimize interference with the sound being measured.

(iii) Recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of paragraph (c) of this section.

(iv) Acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal must be described in terms of its average and maximum rms value for a nonoverload signal level.

(v) Analysis equipment with the response and accuracy requirements of paragraph (d) of this section.

(c) *Sensing, recording, and reproducing equipment.* (1) The sound produced by the aircraft shall be recorded in such a way that the complete information, time history included, is retained. A magnetic tape recorder is acceptable.

(2) The characteristics of the system must comply with the recommendations given in International Electrotechnical Commission (IEC) Publication No. 179 with regard to the sections concerning microphone and amplifier characteristics. The text and specifications of IEC Publication No. 179 entitled: "Precision Sound Level Meters" are incorporated by reference into this part and are made a part hereof as provided in 5 U.S.C. 552(a)(1) and 1 CFR Part 20. This publication was published in 1965 by the Bureau Central de la Commission Electrotechnique Internationale located at 1, rue de Varembe, Geneva, Switzerland, and copies may be purchased at that place. Copies of this publication are available for examination at the DOT Library, Federal Office Building 10A Branch and at the Office of Noise Abatement both located at Headquarters, Federal Aviation Administration, 800 Independence Avenue, Washington, D.C. Moreover, copies of this publication are available for examination at the Regional Offices of the FAA. Furthermore, a historic, official file will be maintained by the Office of Noise Abatement and will contain any changes made to this publication.

(3) The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude must lie within the tolerance limits specified in IEC Publication No. 179, over the frequency range 45 to 11,200 Hz.

(4) If limitations of the dynamic range of the equipment make it necessary, high frequency preemphasis must be added to the recording channel with the converse deemphasis on playback. The preemphasis must be applied such that the instantaneous recorded sound pressure level of the noise signal between 800 and 11,200 Hz does not vary more than 20 dB between the maximum and minimum one-third octave bands.

(5) The equipment must be acoustically calibrated using facilities for acoustic freefield calibration and electronically calibrated as stated in paragraph (d) of this section.

(6) A windscreen must be employed with the microphone during all measurements of aircraft noise when the wind speed is in excess of 6 knots. Corrections for any insertion loss produced by the windscreen, as a function of frequency, must be applied to the measured data and the corrections applied must be reported.

(d) *Analysis equipment.* (1) A frequency analysis of the acoustical signal shall be performed using one-third octave filters complying with the recommendations given in International Electrotechnical Commission (IEC) Publication No. 225. The text and specifications of IEC publication No. 225 entitled "Octave, Half-Octave and Third-Octave Band Filters Intended for the Analysis of Sounds and Vibrations" are incorporated by reference into this part and are made a part hereof as provided in 5 U.S.C. 552(a)(1) and 1 CFR Part 20. This publication was published in 1966 by the Bureau Central de la Commission Electrotechnique Internationale located at 1, rue de Varembe, Geneva, Switzerland, and copies may be purchased at that place. Copies of this publication are available for examination at the Office of Noise Abatement and at the DOT Library, Federal Office Building 10A Branch both located at Headquarters, Federal Aviation Administration, 800 Independence Avenue, Washington, D.C. Moreover, copies of this publication are available for examination at the Regional Offices of the FAA. Furthermore

a historic, official file will be maintained by the Office of Noise Abatement and will contain any changes made to this publication.

(2) A set of 24 consecutive one-third octave filters must be used. The first filter of the set must be centered at a geometric mean frequency of 50 Hz and the last of 10 kHz.

(3) The analyzer indicating device must be analog, digital, or a combination of both. The preferred sequence of signal processing is:

(i) Squaring the one-third octave filter outputs;

(ii) Averaging or integrating; and

(iii) Linear to logarithmic conversion.

The indicating device must have a minimum crest factor capacity of 3 and shall measure, within a tolerance of ±1.0dB, the true root-mean-square (rms) level of the signal in each of the 24 one-third octave bands. If other than a true rms device is utilized, it must be calibrated for nonsinusoidal signals and time varying levels. The calibration must provide means for converting the output levels to true rms values.

(4) The dynamic response of the analyzer to input signals of both full-scale and 20 dB less than full-scale amplitude, shall conform to the following two requirements:

(i) When a sinusoidal pulse of 0.5-second duration at the geometrical mean frequency of each one-third octave band is applied to the input, the maximum output value shall read 4 dB±1 dB less than the value obtained for a steady state sinusoidal signal of the same frequency and amplitude.

(ii) The maximum output value shall exceed the final steady state value by 0.5±0.5 dB when a steady state sinusoidal signal at the geometrical mean frequency of each one-third octave band is suddenly applied to the analyzer input and held constant.

(5) A single value of the rms level must be provided every 0.5±0.01 second for each of the 24 one-third octave bands. The levels from all of the 24 one-third octave bands must be obtained within a 50-millisecond period. No more than 5 milliseconds of data from any 0.5-second period may be excluded from the measurement.

(6) The amplitude resolution of the analyzer must be at least 0.25 dB.

(7) Each output level from the analyzer must be accurate within ±1.0 dB with respect to the input signal, after all systematic errors have been eliminated. The total systematic errors for each of the output levels must not exceed ±3 dB. For contiguous filter systems, the systematic correction between adjacent one-third octave channels may not exceed 4 dB.

(8) The dynamic range capability of the analyzer for display of a single aircraft noise event must be at least 55 dB in terms of the difference between full-scale output level and the maximum noise level of the analyzer equipment.

(9) The complete electronic system must be subjected to a frequency and amplitude electrical calibration by the use of sinusoidal or broadband signals at frequencies covering the range of 45 to 11,200 Hz, and of known amplitudes covering the range of signal levels furnished by the microphone. If broadband signals are used, they must be described in terms of their average and maximum rms values for a nonoverload signal level.

(e) *Noise measurement procedures.* (1) The microphones must be oriented so that the maximum sound received arrives as nearly as reasonable in the direction for which the microphones are calibrated. The microphones must be placed so that their sensing elements are approximately 4 feet above ground.

(2) Immediately prior to and after each test, a recorded acoustic calibration of the system must be made in the field with an acoustic calibrator for the two purposes of checking system sensitivity and providing an acoustic reference level for the analysis of the sound level data.

(3) For the purpose of minimizing equipment or operator error, field calibrations must be supplemented with the use of an insert voltage device to place a known signal at the input of the microphone, just prior to and after recording aircraft noise data.

(4) The ambient noise, including both acoustical background and electrical noise of the measurement system, must be recorded and determined in the test area with the system gain set at levels which will be used for aircraft noise measurements.

Section A36.3 *Reporting and correcting measured data*—(a) *General.* Data representing physical measurements or corrections to measured data must be recorded in permanent form and appended to the record except that corrections to measurements for normal equipment response deviations need not be reported. All other corrections must be approved. Estimates must be made of the individual errors inherent in each of the operations employed in obtaining the final data.

(b) *Data reporting.* (1) Measured and corrected sound pressure levels must be presented in one-third octave band levels obtained with equipment conforming to the standards described in § A36.2 of this appendix.

(2) The type of equipment used for measurement and analysis of all acoustic aircraft performance and meteorological data must be reported.

(3) The following atmospheric environmental data, measured at hourly intervals or less during the test period at the observation points prescribed in § A36.1(d)(4) of this appendix, must be reported:

(i) Air temperature in degrees Fahrenheit and relative humidity in percent.

(ii) Maximum, minimum, and average wind in knots and their direction.

(iii) Atmospheric pressure in inches of Mercury.

(4) Comments on local topography, ground cover, and events that might interfere with sound recordings must be reported.

(5) The following aircraft information must be reported:

(i) Type, model, and serial numbers (if any) of aircraft and engines.

(ii) Gross dimensions of aircraft and location of engines.

(iii) Aircraft gross weight for each test run.

(iv) Aircraft configuration such as flap and landing gear positions.

(v) Airspeed in knots.

(vi) Engine performance in pounds of net thrust, engine pressure ratios, jet exit temperatures, and fan or compressor shaft rev./min. as recorded by cockpit instruments and manufacturer's data.

(vii) Aircraft height in feet determined by a method independent of cockpit instrumentation such as radar tracking theodolite triangulation, or approved photographic techniques.

(6) Aircraft speed and position and engine performance parameters must be recorded at an approved sampling rate sufficient to correct to the noise type certification reference conditions prescribed in § A36.3(c) of this appendix. Lateral position relative to the extended centerline of the runway, configuration, and gross weight must be reported.

(c) *Noise type certification reference conditions*—(1) *Meteorological conditions.* Aircraft position and performance data and the noise measurements must be corrected to the following noise type certification reference atmospheric conditions:

(a) Sea level pressure of 2116 psf (76 cm mercury),

(b) Ambient temperature of 77° F. (ISA+10°C.),

(c) Relative humidity of 70 percent,

(d) Zero wind.

(2) *Aircraft conditions.* The reference condition for takeoff is the maximum weight except as provided in § 36.1581(b),

The reference conditions for approach are:

(a) Design landing weight, except as provided in § 36.1581(b),

(b) Approach angle of 3°,

(c) Aircraft height of 370 feet above noise measuring station.

(d) *Data corrections.* (1) The noise data must be corrected to the noise type certification reference conditions as stated in § A36.3(c) of this appendix. The measured atmospheric conditions must be those obtained in accordance with § A36.1(d)(4) of this appendix. Atmospheric attenuation of sound requirements are given in § A36.5 of this appendix.

(2) The measured flight path must be corrected by an amount equal to the difference between the applicant's predicted flight paths for the test conditions and for the noise type certification reference conditions. Necessary corrections relating to aircraft flight path or performance may be derived from approved data other than certification test data. The flight path correction procedure for approach noise must be made with reference to a fixed aircraft height of 370 feet and a glide angle of 3°. The effective perceived noise level correction must be less than 2 EPNdB to allow for:

(a) The aircraft not passing vertically above the measuring point.

(b) The difference between 370 feet and the actual minimum distance of the aircraft's ILS antenna from the approach measuring points.

(c) The difference between the actual approach angle and 3°.

Detailed correction requirements are given in § A36.6 of this appendix.

(3) If aircraft sound pressure levels do not exceed the background sound pressure levels by at least 10 dB in any one-third octave band, approved corrections for the contribution of background sound pressure levels to observed sound pressure levels must be applied.

(e) *Validity of results.* (1) The test results must produce three average EPNL values and their 90 percent confidence limits, each being the arithmetic average of the corrected acoustical measurements for all valid test runs at the takeoff, approach, and sideline measuring points, respectively. If more than one acoustic measurement system is used at any single measurement location (such as for the symmetrical sideline measuring points), the resulting data for each test run must be averaged as a single measurement.

(2) The minimum sample size acceptable for each of the three certification measuring points is six. The samples must be large enough to establish statistically for each of the three average noise type certification levels a 90 percent confidence limit not exceeding ±1.5 EPNdB. No test result may be omitted from the average process unless otherwise specified by the FAA.

(3) The average EPNL values and their 90 percent confidence limits obtained by the foregoing process must be those by which the noise performance of the aircraft is assessed against the noise type certification criteria, and must be reported.

Section A36.4 *Symbols and units*—(a) *General.* The symbols used in Appendixes A and B of this part have the following meanings.

Symbol	Unit	Meaning
ant		*Antilogarithm to the Base 10.*
C(k)	dB	*Tone Correction.* The factor to be added to PNL(k) to account for the presence of spectral irregularities such as tones at the k-th increment of time.
d	sec	*Duration Time.* The length of the significant noise time history being the time interval between the limits of t(1) and t(2) to the nearest second.
D	dB	*Duration Correction.* The factor to be added to PNLM to account for the duration of the noise.
EPNL	EPNdB	*Effective Perceived Noise Level.* The value of PNL adjusted for both the presence of discrete frequencies and the time history. (The unit EPNdB is used instead of the unit dB.)
f(i) or fi	Hz	*Frequency.* The geometrical mean frequency for the i-th one-third octave band.
F(i, k)	dB	*Delta-dB.* The difference between the original and background sound pressure levels in the i-th one-third octave band at the k-th interval of time.
h	dB	*dB-Down.* The level to be subtracted from PNLTM that defines the duration of the noise.
H	%	*Relative Humidity.* The ambient atmospheric relative humidity.
(i) or i		*Frequency Band Index.* The numerical indicator that denotes any one of the 24 one-third octave bands with geometrical mean frequencies from 50 to 10,000 Hz.
(k)		*Time Increment Index.* The numerical indicator that denotes the number of equal time increments that have elapsed from a reference zero.
log		*Logarithm to the Base 10.*
log n(s)		*Noy Discontinuity Coordinate.* The log n value of the intersection point of the straight lines representing the variation of SPL with log n.
M(b), M(c)		*Noy Inverse Slope.* The reciprocals of the slopes of the straight lines representing the variation of SPL with log n.
n	noy	*Perceived Noisiness.* The perceived noisiness at any instant of time that occurs in a specified frequency range.
n(i, k)	noy	*Perceived Noisiness.* The perceived noisiness at the k-th instant of time that occurs in the i-th one-third octave band.
n(k)	noy	*Maximum Perceived Noisiness.* The maximum value of all of the 24 values of n(i) that occurs at the k-th instant of time.
N(k)	noy	*Total Perceived Noisiness.* The total perceived noisiness at the k-th instant of time calculated from the 24-instantaneous values of n(i, k).
p(b), p(c)		*Noy Slope.* The slopes of the straight lines representing the variation of SPL with log n.
PNL	PNdB	*Perceived Noise Level.* The perceived noise level at any instant of time (the unit PNdB is used instead of the unit dB).
PNL(k)	PNdB	*Perceived Noise Level.* The perceived noise level calculated from the 24 values of SPL (i,k) at the k-th increment of time. (The unit PNdB is used instead of the unit dB.)
PNLM	PNdB	*Maximum Perceived Noise Level.* The maximum value of PNL(k) that occurs during the aircraft flyover. (The unit PNdB is used instead of the unit dB.)
PNLT	PNdB	*Tone Corrected Perceived Noise Level.* The value of PNL adjusted for the presence of spectral irregularities (discrete frequencies) at any instant of time. (The unit PNdB is used instead of the unit dB.)
PNLT(k)	PNdB	*Tone Corrected Perceived Noise Level.* The value of PNL(k) adjusted for the presence of discrete frequencies that occurs at the k-th increment of time. (The unit PNdB is used instead of the unit dB.)
PNLTM	PNdB	*Maximum Tone Corrected Perceived Noise Level.* The maximum value of PNLT(k) that occurs during the aircraft flyover. (The unit PNdB is used instead of the unit dB.)
s(i,k)	dB	*Slope of Sound Pressure Level.* The change in level between adjacent one-third octave band sound pressure levels at the i-th band for the k-th instant of time.
Δs(i, k)	dB	*Change in Slope of Sound Pressure Level.*
s'(i, k)	dB	*Adjusted Slope of Sound Pressure Level.* The change in level between adjacent adjusted one-third octave band sound pressure levels at the i-th band for the k-th instant of time.
s̄(i, k)	dB	*Average Slope of Sound Pressure Level.*
SPL	dB re 0.0002 microbar.	*Sound Pressure Level.* The sound pressure level at any instant of time that occurs in a specified frequency range.
SPL(s)	dB re 0.0002 microbar.	*Noy Discontinuity Coordinate.* The SPL value of the intersection point of the straight lines representing the variation of SPL with log n.
SPL(b), SPL(c)	dB re 0.0002 microbar.	*Noy Intercept.* The intercepts on the SPL-axis of the straight lines representing the variation of SPL with log n.
SPL(i, k)	dB re 0.0002 microbar.	*Sound Pressure Level.* The sound pressure level at the k-th instant of time that occurs in the i-th one-third octave band.
SPL'(i, k)	dB re 0.0002 microbar.	*Adjusted Sound Pressure Level.* The first approximation to background level in the i-th one-third octave band for the k-th instant of time.
SPL"(i, k)	dB re 0.0002 microbar	*Background Sound Pressure Level.* The final approximation to background level in the i-th one-third octave band for the k-th instant of time.
SPLi	dB re 0.0002 microbar	*Maximum Sound Pressure Level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM.
SPLic	dB re 0.0002 microbar	*Corrected Maximum Sound Pressure Level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM corrected for atmospheric sound absorption.
t	sec	*Elapsed Time.* The length of time measured from a reference zero.
t(1), t(2)	sec	*Time Limit.* The beginning and end of the significant noise time history defined by h.
Δt	sec	*Time Increment.* The equal increments of time for which PNL(k) and PNLT(k) are calculated.
T	sec	*Normalizing Time Constant.* The length of time used as a reference in the integration method for computing duration corrections.
T	°F	*Temperature.* The ambient atmospheric temperature.
α(i	dB/feet.	*Test Atmospheric Absorption.* The atmospheric attenuation of sound that occurs in the i-th one-third octave band for the measured atmospheric temperature and relative humidity.
α(i'	dB/1000 feet.	
α(o	dB/feet.	*Reference Atmospheric Absorption.* The atmospheric attenuation of sound that occurs in the i-th one-third octave band for the reference atmospheric temperature and relative humidity.
α(o'	dB/1000 feet.	
β	degrees	*First Constant Climb Angle.*
γ	degrees	*Second Constant Climb Angle.*
δ	degrees.	*Thrust Cutback Angles.* The angles defining the points on the takeoff flight path at which thrust reduction is started and ended respectively.
ε	degrees.	
η	degrees	*Approach Angle.*
θ	degrees	*Takeoff Noise Angle.* The angle between the flight path and noise path for takeoff operation. It is identical for both measured and corrected flight paths.
λ	degrees	*Approach Noise Angle.* The angle between the flight path and the noise path for approach operation. It is identical for both measured and corrected flight paths.
Δ1	EPNdB	*PNLT Correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences in atmospheric absorption and noise path length between reference and test conditions.
Δ2	EPNdB	*Noise Path Duration Correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to the noise duration because of differences in flyover altitude between reference and test condition.
Δ3	EPNdB	*Weight Correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences between maximum and test aircraft weights.
Δ4	EPNdB	*Approach Angle Correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences between 3° and the test approach angle.
ΔAB	feet.	*Takeoff Profile Changes.* The changes in the basic parameters defining the takeoff profile due to differences between reference and test conditions.
Δβ	degrees.	
Δγ	degrees.	
Δδ	degrees.	
Δε	degrees.	

FLIGHT PROFILE IDENTIFICATION POSITIONS

Position	*Description*
A	Start of takeoff roll.
B	Liftoff.
C	Start of first constant climb.
D	Start of thrust reduction.
E	Start of second constant climb.
Ec	Start of second constant climb on corrected flight path.
F	End of noise certification takeoff flight path.
Fc	End of second constant climb on corrected flight path.
G	Start of noise certification approach flight path.
Gr	Start of noise certification approach on reference flight path.
H	Position on approach path directly above noise measuring station.
I	Start of level off.
Ir	Start of level off on reference approach flight path.
J	Touchdown.
K	Takeoff noise measuring station.
L	Sideline noise measuring station (not on flight track).

FLIGHT PROFILE IDENTIFICATION POSITIONS—Continued

Position	Description
M	End of noise type certification takeoff flight track.
N	Approach noise measuring station.
O	Threshold of approach end of runway
P	Start of noise type certification approach flight track.
Q	Position on measured takeoff flight path corresponding to PNLTM at station K.
Qc	Position on corrected takeoff flight path corresponding to PNLTM at station K.
R	Position on measured takeoff flight path nearest to station K.
Rc	Position on corrected takeoff flight path nearest to station K.
S	Position on measured approach flight path corresponding to PNLTM at station N.
Sr	Position on reference approach flight path corresponding to PNLTM at station N.
T	Position on measured approach flight path nearest to station N.
Tr	Position on reference approach flight path nearest to station N.
X	Position on measured takeoff flight path corresponding to PNLTM at station L.

FLIGHT PROFILE DISTANCES

Distance	Unit	Meaning
AB	feet	*Length of Takeoff Roll.* The distance along the runway between the start of takeoff roll and lift off.
AK	feet	*Takeoff Measurement Distance.* The distance from the start of roll to the takeoff noise measurement station along the extended centerline of the runway.
AM	feet	*Takeoff Flight Track Distance.* The distance from the start of roll to the takeoff flight track position along the extented centerline of the runway for which the position of the aircraft need no longer be recorded.
KQ	feet	*Measured Takeoff Noise Path.* The distance from station K to the measured aircraft position Q.
KQc	feet	*Corrected Takeoff Noise Path.* The distance from station K to the corrected aircraft position Qc.
KR	feet	*Measured Takeoff Minimum Distance.* The distance from station K to point R on the measured flight path.
KRc	feet	*Corrected Takeoff Minimum Distance.* The distance from station K to point Rc on the corrected flight path.
LX	feet	*Measured Sideline Noise Path.* The distance from station L to the measured aircraft position X.
NH	feet	*Aircraft Approach Height.* The vertical distance between the aircraft and the approach measuring station.
NS	feet	*Measured Approach Noise Path.* The distance from station N to the measured aircraft position S.
NSr	feet	*Reference Approach Noise Path.* The distance from station N to the reference aircraft position Sr.
NT	feet	*Measured Approach Minimum Distance.* The distance from station N to point T on the measured flight path.
NTr	feet	*Reference Approach Minimum Distance.* The distance from station N to point Tr on the corrected flight path; it equals 360 feet.
ON	feet	*Approach Measurement Distance.* The distance from the runway threshold to the approach measurement station along the extended centerline of the runway.
OP	feet	*Approach Flight Track Distance.* The distance from the runway threshold to the approach flight track position along the extended centerline of the runway for which the position of the aircraft need no longer be recorded.

Section A36.5 *Atmospheric attenuation of sound*—(a) *General.* The atmospheric attenuation of sound must be determined in accordance with the curves of Figure 15 presented in SAE ARP 866 or by the simplified procedure presented below. SAE ARP 866 is a publication entitled: "Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity for Use in Evaluating Aircraft Flyover Noise" and the recommendations presented therein are incorporated by reference into this Part and are made a part hereof as provided in 5 U.S.C. 522(a)(1) and 1 CFR Part 20. This publication was published on August 31, 1964, by the Society of Automotive Engineers, Inc., located at 2 Pennsylvania Plaza, New York, N.Y. 10001, and copies may be purchased at that place. Copies of this publication are available for examination at the DOT Library, Federal Office Building 10A Branch and at the Office of Noise Abatement both located at Headquarters, Federal Aviation Administration, 800 Independence Avenue, Washington, D.C. Moreover, copies of this publication are available for examination at the Regional Offices of the FAA. Furthermore, a historic, official file will be maintained by the Office of Noise Abatement and will contain any changes made to this publication.

(b) *Reference conditions.* For the reference atmospheric conditions of temperature and relative humidity equal to 77° F. and 70 percent, respectively, and for all other conditions of temperature and relative humidity where their product is equal to or greater than 4,000, the sound absorption must be expressed by the following equation:

$$\alpha_{io}' = f_i/500 \text{ (dB/1,000 ft.)}$$

α_{io}' is the atmospheric attenuation of sound that occurs in the i-th one-third octave band for the reference atmospheric conditions and f_i is the geometrical mean frequency for the i-th one-third octave band.

(c) *Nonreference conditions.* (1) For all atmospheric conditions of temperature and relative humidity where their product is equal to or less than 4,000, the relationship between sound absorption, frequency, temperature, and humidity must be expressed by the following equation:

$$500\ \alpha_i'/f_i = (2/3)\ [(11/2) - (HT/1{,}000)]$$

α_i' is the atmospheric attenuation of sound that occurs in the i-th one-third octave band for a relative humidity of H percent and a temperature of T° Fahrenheit.

(2) Figure A1 graphically illustrates the simplified relationship. The second equation represents the inclined line which is valid for all values of HT up to and including 4,000. For all values of 4,000 and greater, the horizontal line, represented by the first equation, is valid. The minimum, reference, and maximum values of humidity and temperature are indicated in Figure A1.

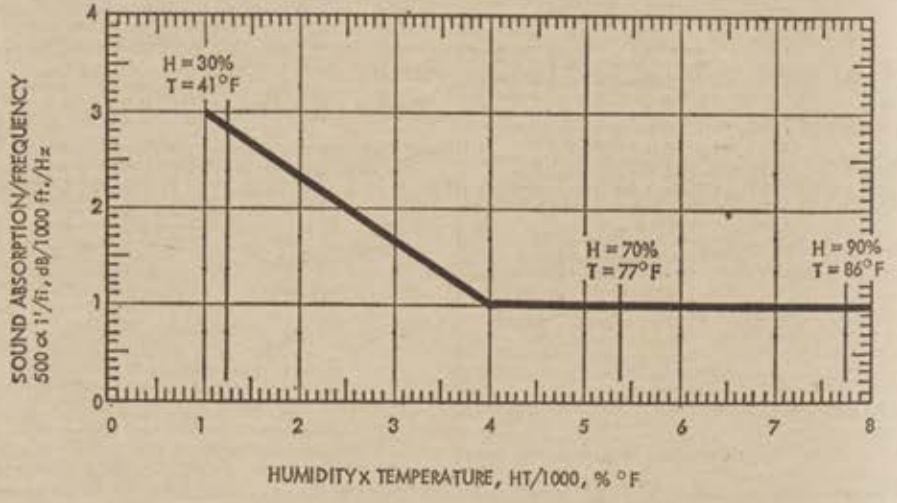

FIGURE A1. SIMPLIFIED RELATIONSHIP BETWEEN ATMOSPHERIC SOUND ATTENUATION, FREQUENCY, HUMIDITY, AND TEMPERATURE.

Section A36.6 *Detailed correction procedures*—(a) *General.* If the noise type certification test conditions are not equal to the noise certification reference conditions, appropriate positive corrections must be made to the EPNL calculated from the measured data. Differences between reference and test conditions which lead to positive corrections can result from the following:

(1) Atmospheric absorption of sound under test conditions greater than reference,

(2) Test flight path at higher altitude than reference, and

(3) Test weight less than maximum.

Negative corrections are permitted if the atmospheric absorption of sound under test conditions is less than reference and also if the test flight path is at a lower altitude than reference.

The takeoff test flight path can occur at a higher altitude than reference if the meteorological conditions permit superior aerodynamic performance ("cold day" effect). Conversely, the "hot day" effect can cause the takeoff test flight path to occur at a lower altitude than reference. The approach test flight path can occur at either higher or lower altitudes than reference irrespective of the meteorological conditions.

The correction procedures presented in the following discussion consist of one or more of five possible values added algebraically to

the EPNL calculated as if the tests were conducted completely under the noise type certification reference conditions. The flight profiles must be determined for both takeoff and approach, and for both reference and test conditions. The test procedures require noise and flight path recordings with a synchronized time signal from which the test profile can be delineated, including the aircraft position for which PNLTM is observed at the noise measuring station. For takeoff, a flight profile corrected to reference conditions may be derived from manufacturer's data, and for approach, the reference profile is known.

The noise paths from the aircraft to the noise measuring station corresponding to PNLTM are determined for both the test and reference profiles. The SPL values in the spectrum of PNLTM are then corrected for the effects of:

(1) Change in atmospheric sound absorption,

(2) Atmospheric sound absorption on the change in noise path length,

(3) Inverse square law on the change in noise path length.

The corrected values of SPL are then converted to PNLT from which is subtracted PNLTM. The difference represents the correction to be added algebraically to the EPNL calculated from the measured data.

The minimum distances from both the test and reference profiles to the noise measuring station are calculated and used to determine a noise duration correction due to the change in the altitude of aircraft flyover. The duration correction is added algebraically to the EPNL calculated from the measured data.

From approved data in the form of curves or tables giving the variation of EPNL with takeoff weight and also for landing weight, corrections are determined to be added to the EPNL calculated from the measured data to account for noise level changes due to differences between maximum and test aircraft weights.

From approved data in the form of curves or tables giving the variation of EPNL with approach angle, corrections are determined to be added algebraically to the EPNL calculated from measured data to account for noise level changes due to differences between 3° and the test approach angle.

(b) *Takeoff profiles.* Figure A2 illustrates a typical takeoff profile. The aircraft begins the takeoff roll at point A, lifts off at point B, and initiates the first constant climb at point C at an angle β. The noise abatement thrust cutback is started at point D and completed at point E where the second constant climb is defined by the angle δ (usually expressed in terms of the gradient in per cent).

The end of the noise type certification takeoff flight path is represented by aircraft position F whose vertical projection on the flight track (extended centerline of the runway) is point M. The position of the aircraft must be recorded for a distance AM of at least 6 nautical miles.

Position K is the takeoff noise measuring station whose distance AK is specified as 3.5 nautical miles. Position L is the sideline noise measuring station located on a line parallel to and a specified distance from the runway centerline where the noise level during takeoff is greatest.

The takeoff profile is defined by the following five parameters: AB, the length of takeoff roll; β, the first constant climb angle; γ, the second constant climb angle; and δ and ϵ, the thrust cutback angles. These five parameters are functions of the aircraft performance and weight and the atmospheric conditions of temperature, pressure, and wind velocity and direction. If the test conditions are not equal to the reference conditions, the corresponding test and reference profile parameters will be different as shown in Figure A3. The profile parameter changes, identified as $\triangle$AB, $\triangle\beta$, $\triangle\alpha$, $\triangle\delta$, and $\triangle\epsilon$, can be derived from the manufacturer's data (approved by the FAA) and can be used to define the flight profile corrected to the reference conditions. The relationships between the measured and corrected takeoff flight profiles can then be used to determine the corrections, which if positive, must be applied to the EPNL calculated from the measured data.

NOTE: Under reference atmospheric conditions and with maximum takeoff weight, the gradient of the second constant climb angle, δ, is specified to be not less than 4 percent. However, the actual gradient will depend upon the test atmospheric conditions, assuming maximum takeoff weight and the parameters characterizing engine performance are constant (rpm, epr, or any other parameter used by the pilot).

Figure A4 illustrates portions of the measured and corrected takeoff flight paths including the significant geometrical relationships influencing sound propagation. EF represents the measured second constant flight path with climb angle γ, and EcFc represents the corrected second constant flight path at reduced altitude and with reduced climb angle $\delta - \Delta\delta$.

Position Q represents the aircraft location on the measured takeoff flight path for which PNLTM is observed at the noise measuring station K, and Qc is the corresponding position on the corrected flight path. The measured and corrected noise propagation paths are KQ and KQc, respectively, which form the same angle θ with their flight paths.

Position R represents the point on the measured takeoff flight path nearest the noise measuring station K, and Rc is the corresponding position on the corrected flight path. The minimum distance to the measured and corrected flight paths are indicated by the lines KR and KRc, respectively, which are normal to their flight paths.

(c) *Approach profiles.* Figure A5 illustrates a typical approach profile. The beginning of the noise type certification approach profile is represented by aircraft position G whose vertical projection on the flight track (extended centerline of the runway) is point P. The position of the aircraft must be recorded for a distance OP from the runway threshold O of at least 4 nautical miles.

The aircraft approaches at an angle η, passes vertically over the noise measuring station N at a height of NH, begins the level off at position I, and touches down at position J. The distance ON is specified as 1.0 nautical mile.

The approach profile is defined by the approach angle η and the height NH which are functions of the aircraft operating conditions controlled by the pilot. If the measured approach profile parameters are different from the corresponding reference approach parameters (3° and 370 feet, respectively, as shown in Figure A6), corrections, if positive, must be applied to the EPNL calculated from the measured data.

Figure A7 illustrates portions of the measured and reference approach flight paths including the significant geometrical relationships influencing sound propagation. GI represents the measured approach path with approach angle η, and GrIr represents the reference approach flight path at lower altitude and approach angle of 3°.

Position S represents the aircraft location on the measured approach flight path for which PNLTM is observed at the noise measuring station N, and Sr is the corresponding position on the reference approach flight path. The measured and corrected noise propagation paths are NS and NSr, respectively, which form the same angle λ with their flight paths.

Position T represents the point on the measured approach flight path nearest the noise measuring station N, and Tr is the corresponding point on the reference approach flight path. The minimum distances to the measured and reference flight paths are indicated by the lines NT and NTr, respectively, which are normal to their flight paths.

NOTE: The reference approach flight path is defined by $\eta = 3°$ and NH = 370 feet. Consequently, NTr can also be defined; NTr = 369 feet to the nearest foot and is, therefore, considered to be one of the reference parameters.

(d) *PNLT corrections.* Whenever the ambient atmospheric conditions of temperature and relative humidity differ from the reference conditions (77° F. and 70 percent, respectively) and whenever the measured takeoff and approach flight paths differ from the corrected and reference flight paths respectively, it may be necessary or desirable to apply corrections to the EPNL values calculated from the measured data. If the corrections are required, they must be calculated as described below.

Referring to the takeoff flight path shown in Figure A4, the spectrum of PLNTM observed at station K for the aircraft at position Q, is decomposed into its individual SPLi values. A set of corrected values are then computed as follows:

$$\begin{aligned} SPLic = SPLi &+ (\alpha i - \alpha io)\, KQ \\ &+ \alpha io\, (KQ - KQc) \\ &+ 20 \log\, (KQ/KQc) \end{aligned}$$

where SPLi and SPLic are the measured and corrected sound pressure levels, respectively, in the i-th one-third octave band. The first correction term accounts for the effects of change in atmospheric sound absorption where αi and αio are the sound absorption coefficients for the test and reference atmospheric conditions, respectively, for the

i-th one-third octave band and KQ is the measured takeoff noise path. The second correction term accounts for the effects of atmospheric sound absorption on the change in the noise path length where KQc is the corrected takeoff noise path. The third correction term accounts for the effects of the inverse square law on the change in the noise path length.

The corrected values of SPLic are then converted to PNLT and a correction term calculated as follows:

$$\Delta 1 = PNLT - PNLTM$$

which represents the correction to be added algebraically to the EPNL calculated from the measured data.

The same procedure is used for the approach flight path except that the values for SPLic relate to the approach noise paths shown in Figure A7 as follows:

$$SPLic = SPLi + (\alpha i - \alpha io)\ NS + \alpha io\ (NS - NSr) + 20 \log\ (NS/NSr)$$

where NS and NSr are the measured and reference approach noise paths, respectively. The remainder of the procedure is the same as for the takeoff flight path.

The same procedure is used for the sideline flight path except that the values for SPLic relate only to the measured sideline noise path as follows:

$$SPLic = SPLi + (\alpha i - \alpha io)\ LX$$

where LX is the measured sideline noise path from station L (Figure A2) to position X of the aircraft for which PNLTM is observed at station L. Only the correction term accounting for the effects of change in atmospheric sound absorption is considered. The difference between the measured and corrected noise path lengths are assumed negligible for the sideline flight path. The remainder of the procedure is the same as for the takeoff flight path.

(e) *Duration corrections.* Whenever the measured takeoff and approach flight paths differ from the corrected and reference flight paths, respectively, it may be necessary or desirable to apply duration corrections to the EPNL values calculated from the measured data. If the corrections are required, they shall be calculated as described below.

Referring to the takeoff flight path shown in Figure A4, a correction term is calculated as follows:

$$\Delta 2 = -10 \log\ (KR/KRc)$$

which represents the correction to be added algebraically to the EPNL calculated from the measured data. The lengths KR and KRc are the measured and corrected takeoff minimum distances, respectively, from the noise measuring station K, to the measured and corrected flight paths. The negative sign indicates that, for the particular case of a duration correction, the EPNL calculated from the measured data is reduced if the measured flight path is at a greater altitude than the corrected flight path.

The same procedure is used for the approach flight path except that the correction relates to the approach minimum distances shown in Figure A7 as follows:

$$\Delta 2 = -10 \log\ (NT/369)$$

where NT is the measured approach minimum distance from the noise measuring station N to the measured flight path and 369 feet is the minimum distance from station N to the reference flight path.

No duration correction is computed for the sideline flight path because the differences between the measured and corrected flight paths are assumed negligible.

(f) *Weight corrections.* Whenever the aircraft weight, during either the noise type certification takeoff, sideline, or approach test, is less than the corresponding maximum takeoff or landing weight, a correction must be applied to the EPNL value calculated from the measured data. The corrections are determined from approved data in the form of tables or curves such as schematically indicated in Figures A8 and A9. The data must be applicable to the noise type certification reference atmospheric conditions.

(g) *Approach angle corrections.* Whenever the aircraft approach angle during the noise type certification approach test is greater than 3°, a correction must be applied to the EPNL value calculated from the measured data. The corrections are determined from approved data in the form of tables or curves such as schematically indicated in Figure A10. The data must be applicable to the noise type certification reference atmospheric conditions and to the test landing weight.

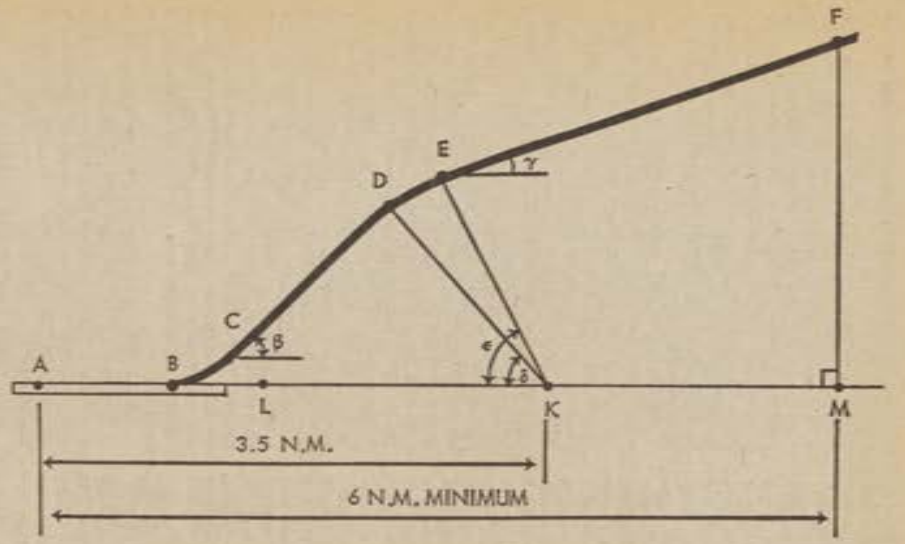

FIGURE A2. MEASURED TAKEOFF PROFILE.

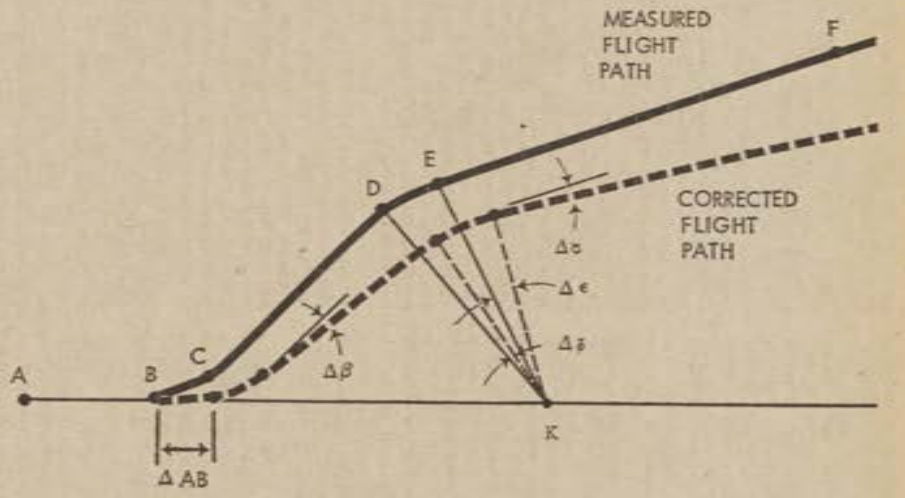

FIGURE A3. COMPARISON OF MEASURED AND CORRECTED TAKEOFF PROFILES.

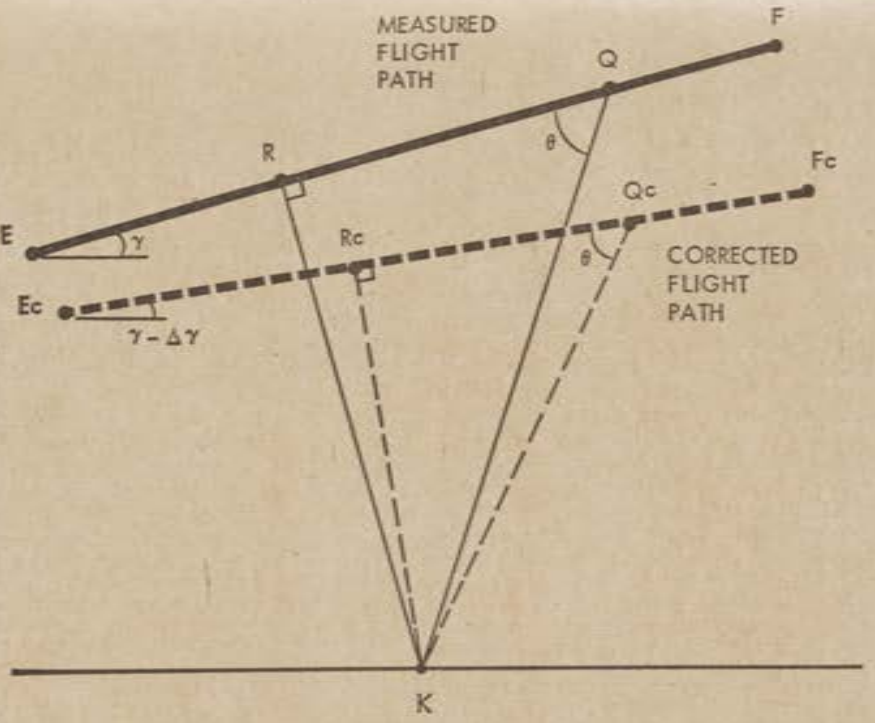

FIGURE A4. TAKEOFF PROFILE CHARACTERISTICS INFLUENCING SOUND PROPAGATION.

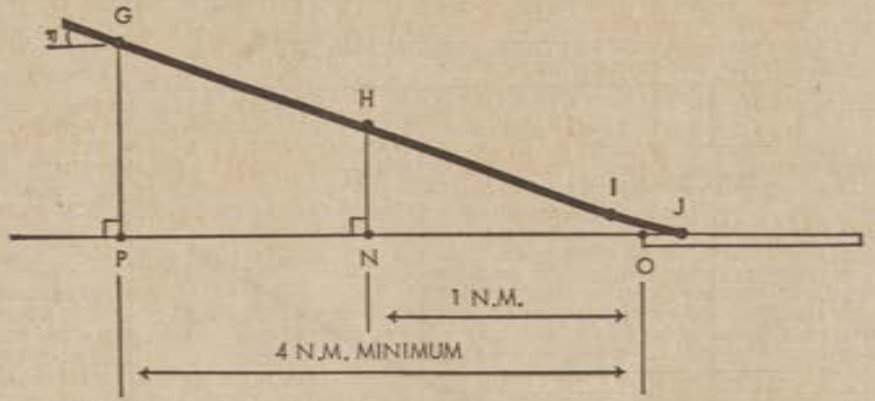

FIGURE A5. MEASURED APPROACH PROFILE.

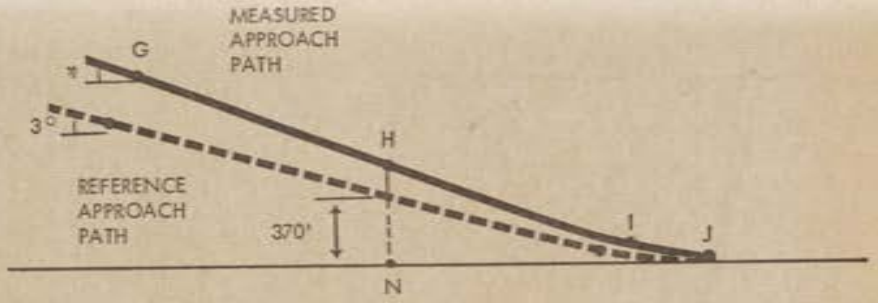

FIGURE A6. COMPARISON OF MEASURED AND CORRECTED APPROACH PROFILES.

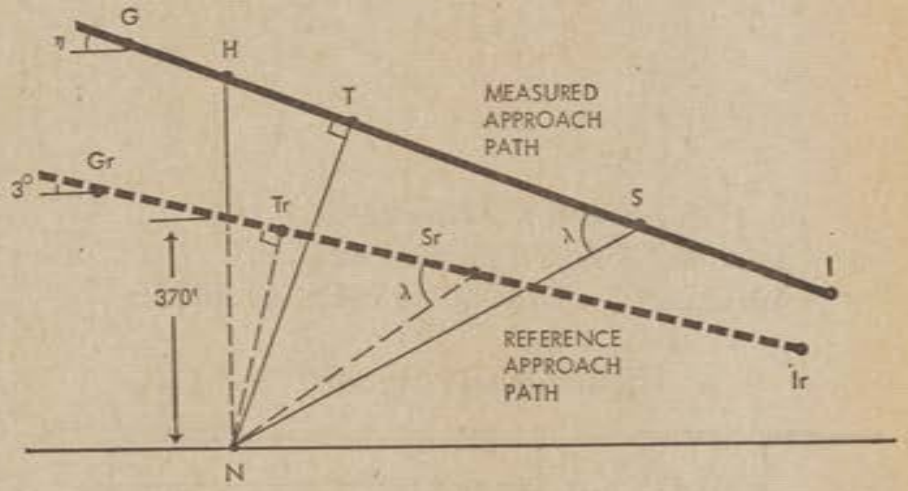

FIGURE A7. APPROACH PROFILE CHARACTERISTICS INFLUENCING SOUND PROPAGATION.

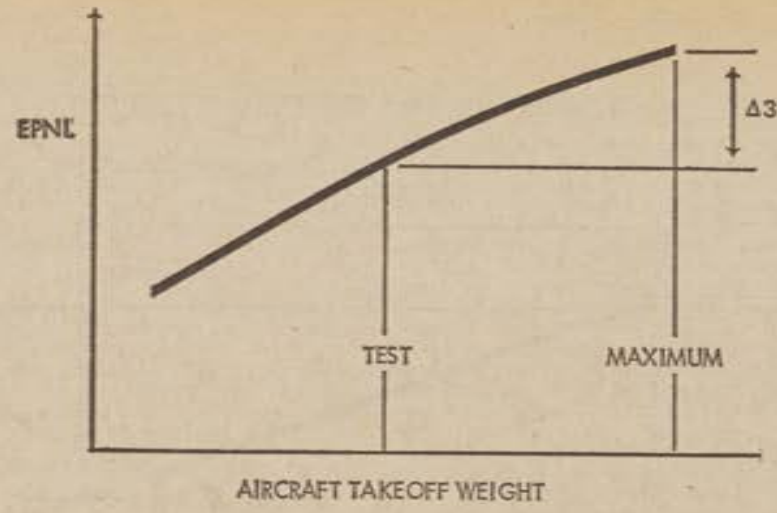

FIGURE A8. TAKEOFF WEIGHT CORRECTION FOR EPNL AT 3.5 NAUTICAL MILES FROM BRAKE RELEASE.

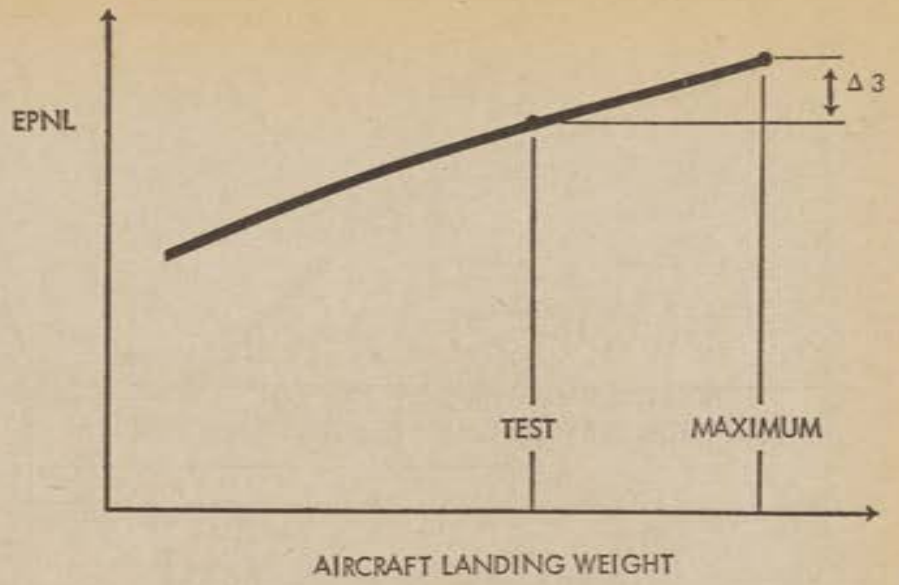

FIGURE A9. APPROACH WEIGHT CORRECTION FOR EPNL AT 1.0 NAUTICAL MILE FROM RUNWAY THRESHOLD.

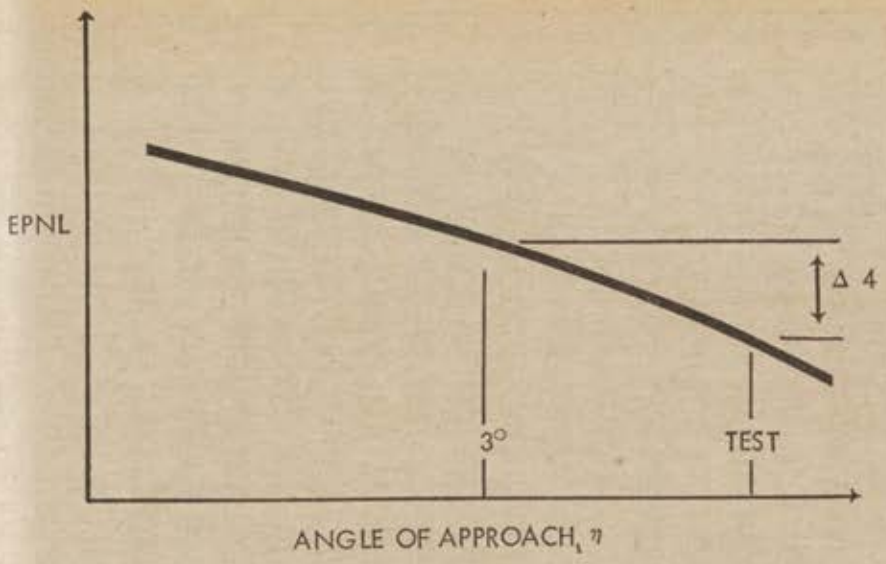

FIGURE A10. APPROACH ANGLE CORRECTION FOR EPNL AT 1.0 NAUTICAL MILE FROM RUNWAY THRESHOLD.

APPENDIX B—AIRCRAFT NOISE EVALUATION UNDER § 36.103

Section B36.1 *General.* The procedures in this appendix must be used to determine the noise evaluation quantity designated as effective perceived noise level, EPNL, under § 36.103. These procedures, which use the physical properties of noise measured as prescribed by Appendix A of this part, consist of the following:

(a) The 24 one-third octave bands of sound pressure level are converted to perceived noisiness by means of a noy table. The noy values are combined and then converted to instantaneous perceived noise levels, PNL(k).

(b) A tone correction factor, C(k), is calculated for each spectrum to account for the subjective response to the presence of the maximum tone.

(c) The tone correction factor is added to the perceived noise level to obtain tone corrected perceived noise levels, PNLT(k), at each one-half second increment of time. The instantaneous values of tone corrected perceived noise level are noted with respect to time and the maximum value, PNLTM, is determined.

$$PNLT(k) = PNL(k) + C(k)$$

(d) A duration correction factor, D, is computed by integration under the curve of tone corrected perceived noise level versus time.

(e) Effective perceived noise level, EPNL, is determined by the algebraic sum of the maximum tone corrected perceived noise level and the duration correction factor.

$$EPNL = PNLTM + D$$

Section B36.2 *Perceived noise level.* Instantaneous perceived noise levels, PNL(k), must be calculated from instantaneous one-third octave band sound pressure levels, SPL(i,k), as follows:

Step 1. Convert each one-third octave band SPL(i,k), from 50 to 10,000 Hz, to perceived noisiness, n(i,k), by reference to Table B1, or to the mathematical formulation of the noy table given in § B36.7 of this appendix.

Step 2. Combine the perceived noisiness values, n(i,k), found in step 1 by the following formula:

$$N(k) = n(k) + 0.15\left[\left[\sum_{i=1}^{24} n(i,k)\right] - n(k)\right]$$

$$= 0.85n(k) + 0.15\sum_{i=1}^{24} n(i,k)$$

where $n(k)$ is the largest of the 24 values of n(i,k) and N(k) is the total perceived noisiness.

Step 3. Convert the total perceived noisiness, N(k), into perceived noise level, PNL(k), by the following formula:

$$PNL(k) = 40.0 + 33.3 \log N(k)$$

which is plotted in Figure B1. PNL(k) may also be obtained by choosing N(k) in the 1,000 Hz column of Table B1 and then reading the corresponding value of SPL(i,k) which, at 1,000 Hz, equals PNL(k).

Table B1. Perceived Noisiness (NOYs) as a Function of Sound Pressure Level.

SPL dB	One-Third Octave Band Center Frequencies f, HZ																							
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
28																			1.00	1.00				
29																		1.00	1.07	1.07	1.00			
30																		1.07	1.15	1.15	1.07	1.00		
31																		1.15	1.23	1.23	1.15	1.07		
32																	1.00	1.23	1.32	1.32	1.23	1.15	1.00	
33																	1.07	1.32	1.41	1.41	1.32	1.23	1.07	
34																1.00	1.15	1.41	1.51	1.51	1.41	1.32	1.15	
35																1.07	1.23	1.51	1.62	1.62	1.51	1.41	1.23	
36																1.15	1.32	1.62	1.74	1.74	1.62	1.51	1.32	
37																1.23	1.41	1.74	1.86	1.86	1.74	1.62	1.41	
38																1.32	1.51	1.86	2.00	2.00	1.86	1.74	1.51	
39															1.00	1.41	1.62	1.99	2.14	2.14	2.00	1.86	1.62	
40										1.00	1.00	1.00	1.00	1.00	1.02	1.51	1.74	2.14	2.29	2.29	2.14	1.99	1.74	1.00
41									1.00	1.07	1.07	1.07	1.07	1.07	1.07	1.62	1.86	2.29	2.45	2.45	2.29	2.14	1.86	1.10
42									1.07	1.15	1.15	1.15	1.15	1.15	1.15	1.74	1.99	2.45	2.61	2.61	2.45	2.29	1.99	1.21
43									1.15	1.23	1.23	1.23	1.23	1.23	1.23	1.86	2.14	2.61	2.78	2.78	2.61	2.45	2.14	1.34
44									1.23	1.32	1.32	1.32	1.32	1.32	1.32	1.99	2.29	2.78	2.96	2.96	2.78	2.61	2.29	1.48
45									1.32	1.41	1.41	1.41	1.41	1.41	1.41	2.14	2.45	2.96	3.15	3.15	2.96	2.78	2.45	1.63
46									1.41	1.51	1.51	1.51	1.51	1.51	1.51	2.29	2.61	3.15	3.35	3.35	3.15	2.96	2.61	1.78
47									1.51	1.62	1.62	1.62	1.62	1.62	1.62	2.45	2.78	3.35	3.56	3.56	3.35	3.15	2.78	1.99
48									1.62	1.74	1.74	1.74	1.74	1.74	1.74	2.61	2.96	3.56	3.78	3.78	3.56	3.35	2.96	2.19
49									1.74	1.86	1.86	1.86	1.86	1.86	1.87	2.78	3.15	3.78	4.02	4.02	3.78	3.56	3.15	2.40
50									1.86	1.99	1.99	1.99	1.99	1.99	2.00	2.96	3.35	4.02	4.26	4.26	4.02	3.78	3.35	2.63
51									1.99	2.14	2.14	2.14	2.14	2.14	2.14	3.15	3.56	4.26	4.52	4.52	4.26	4.02	3.56	2.91
52									2.14	2.29	2.29	2.29	2.29	2.29	2.29	3.35	3.78	4.52	4.79	4.79	4.52	4.26	3.78	3.23
53									2.29	2.45	2.45	2.45	2.45	2.45	2.45	3.56	4.02	4.79	5.08	5.08	4.79	4.52	4.02	3.56
54									2.45	2.61	2.61	2.61	2.61	2.61	2.61	3.78	4.26	5.08	5.38	5.38	5.08	4.79	4.26	3.91
55									2.61	2.78	2.78	2.78	2.78	2.78	2.78	4.02	4.52	5.38	5.70	5.70	5.38	5.08	4.52	4.30
56									2.78	2.96	2.96	2.96	2.96	2.96	2.96	4.26	4.79	5.70	6.04	6.04	5.70	5.38	4.79	4.73
57									2.96	3.15	3.15	3.15	3.15	3.15	3.15	4.52	5.08	6.04	6.40	6.40	6.04	5.70	5.08	5.24
58									3.15	3.35	3.35	3.35	3.35	3.35	3.35	4.79	5.38	6.40	6.78	6.78	6.40	6.04	5.38	5.81
59									3.35	3.56	3.56	3.56	3.56	3.56	3.56	5.08	5.70	6.78	7.18	7.18	6.78	6.40	5.70	6.01
60	1.00								3.56	3.78	3.78	3.78	3.78	3.78	3.78	5.38	6.04	7.18	7.61	7.61	7.18	6.78	6.04	6.44
61	1.41	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.78	4.02	4.02	4.02	4.02	4.02	4.02	5.70	6.40	7.61	8.06	8.06	7.61	7.18	6.40	6.90
62	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	4.02	4.26	4.26	4.26	4.26	4.26	4.26	6.04	6.78	8.06	8.54	8.54	8.06	7.61	6.78	7.32
63	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	4.26	4.52	4.52	4.52	4.52	4.52	4.52	6.40	7.18	8.54	9.05	9.05	8.54	8.06	7.18	7.76
64	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	4.52	4.79	4.79	4.79	4.79	4.79	4.79	6.78	7.61	9.05	9.59	9.59	9.05	8.54	7.61	8.22
65	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	4.79	5.08	5.08	5.08	5.08	5.08	5.08	7.18	8.06	9.59	10.2	10.2	9.59	9.05	8.06	8.71
66	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	5.08	5.38	5.38	5.38	5.38	5.38	5.38	7.61	8.54	10.2	10.8	10.8	10.2	9.59	8.54	9.23
67	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	5.38	5.70	5.70	5.70	5.70	5.70	5.70	8.06	9.05	10.8	11.4	11.4	10.8	10.2	9.05	9.78
68	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	5.70	6.04	6.04	6.04	6.04	6.04	6.04	8.54	9.59	11.4	12.0	12.0	11.4	10.8	9.59	10.4
69	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	6.04	6.40	6.40	6.40	6.40	6.40	6.40	9.05	10.2	12.0	12.7	12.7	12.0	11.4	10.2	11.0
70	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	6.40	6.78	6.78	6.78	6.78	6.78	6.78	9.59	10.8	12.7	13.5	13.5	12.7	12.0	10.8	11.7
71	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	6.78	7.18	7.18	7.18	7.18	7.18	7.18	10.2	11.4	13.5	14.3	14.3	13.5	12.7	11.4	12.4
72	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	7.18	7.61	7.61	7.61	7.61	7.61	7.61	10.8	12.0	14.3	15.2	15.2	14.3	13.5	12.0	13.1
73	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	7.61	8.06	8.06	8.06	8.06	8.06	8.06	11.4	12.7	15.2	16.1	16.1	15.2	14.3	12.7	13.9
74	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	8.06	8.54	8.54	8.54	8.54	8.54	8.54	12.0	13.5	16.1	17.1	17.1	16.1	15.2	13.5	14.7
75	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	8.54	9.05	9.05	9.05	9.05	9.05	9.05	12.7	14.3	17.1	18.1	18.1	17.1	16.1	14.3	15.6
76	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	9.05	9.59	9.59	9.59	9.59	9.59	9.59	13.5	15.2	18.1	19.2	19.2	18.1	17.1	15.2	16.5
77	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	9.59	10.2	10.2	10.2	10.2	10.2	10.2	14.3	16.1	19.2	20.4	20.4	19.2	18.1	16.1	17.5
78	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	10.2	10.8	10.8	10.8	10.8	10.8	10.8	15.2	17.1	20.4	21.6	21.6	20.4	19.2	17.1	18.5
79	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	10.8	11.4	11.4	11.4	11.4	11.4	11.4	16.1	18.1	21.6	22.9	22.9	21.6	20.4	18.1	19.6
80	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	11.4	12.0	12.0	12.0	12.0	12.0	12.0	17.1	19.2	22.9	24.3	24.3	22.9	21.6	19.2	20.8
81	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	12.0	12.7	12.7	12.7	12.7	12.7	12.7	18.1	20.4	24.3	25.8	25.8	24.3	22.9	20.4	22.0
82	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	12.7	13.5	13.5	13.5	13.5	13.5	13.5	19.2	21.6	25.8	27.4	27.4	25.8	24.3	21.6	23.3
83	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	13.5	14.3	14.3	14.3	14.3	14.3	14.3	20.4	22.9	27.4	29.1	29.1	27.4	25.8	22.9	24.7
84	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	14.3	15.2	15.2	15.2	15.2	15.2	15.2	21.6	24.3	29.1	30.9	30.9	29.1	27.4	24.3	26.2
85	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	15.2	16.1	16.1	16.1	16.1	16.1	16.1	22.9	25.8	30.9	32.7	32.7	30.9	29.1	25.8	27.8
86	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	16.1	17.1	17.1	17.1	17.1	17.1	17.1	24.3	27.4	32.7	34.7	34.7	32.7	30.9	27.4	29.4
87	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	17.1	18.1	18.1	18.1	18.1	18.1	18.1	25.8	29.1	34.7	36.7	36.7	34.7	32.7	29.1	31.1
88	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	18.1	19.2	19.2	19.2	19.2	19.2	19.2	27.4	30.9	36.7	38.9	38.9	36.7	34.7	30.9	33.0
89	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	19.2	20.4	20.4	20.4	20.4	20.4	20.4	29.1	32.7	38.9	41.2	41.2	38.9	36.7	32.7	34.9
90	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	20.4	21.6	21.6	21.6	21.6	21.6	21.6	30.9	34.7	41.2	43.6	43.6	41.2	38.9	34.7	37.0
91	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	21.6	22.9	22.9	22.9	22.9	22.9	22.9	32.7	36.7	43.6	46.2	46.2	43.6	41.2	36.7	39.2
92	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	22.9	24.3	24.3	24.3	24.3	24.3	24.3	34.7	38.9	46.2	48.9	48.9	46.2	43.6	38.9	41.5
93	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	24.3	25.8	25.8	25.8	25.8	25.8	25.8	36.7	41.2	48.9	51.8	51.8	48.9	46.2	41.2	44.0
94	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	25.8	27.4	27.4	27.4	27.4	27.4	27.4	38.9	43.6	51.8	54.9	54.9	51.8	48.9	43.6	46.6
95	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	27.4	29.1	29.1	29.1	29.1	29.1	29.1	41.2	46.2	54.9	58.1	58.1	54.9	51.8	46.2	49.4
96	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	29.1	30.9	30.9	30.9	30.9	30.9	30.9	43.6	48.9	58.1	61.6	61.6	58.1	54.9	48.9	52.3
97	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	30.9	32.7	32.7	32.7	32.7	32.7	32.7	46.2	51.8	61.6	65.2	65.2	61.6	58.1	51.8	55.4
98	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	32.7	34.7	34.7	34.7	34.7	34.7	34.7	48.9	54.9	65.2	69.1	69.1	65.2	61.6	54.9	58.7
99	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	34.7	36.7	36.7	36.7	36.7	36.7	36.7	51.8	58.1	69.1	73.2	73.2	69.1	65.2	58.1	62.2
100	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	36.7	38.9	38.9	38.9	38.9	38.9	38.9	54.9	61.6	73.2	77.5	77.5	73.2	69.1	61.6	65.8
101	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	38.9	41.2	41.2	41.2	41.2	41.2	41.2	58.1	65.2	77.5	82.0	82.0	77.5	73.2	65.2	69.7
102	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	41.2	43.6	43.6	43.6	43.6	43.6	43.6	61.6	69.1	82.0	86.9	86.9	82.0	77.5	69.1	73.8
103	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	43.6	46.2	46.2	46.2	46.2	46.2	46.2	65.2	73.2	86.9	92.0	92.0	86.9	82.0	73.2	78.2
104	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	46.2	48.9	48.9	48.9	48.9	48.9	48.9	69.1	77.5	92.0	97.4	97.4	92.0	86.9	77.5	82.8
105	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	48.9	51.8	51.8	51.8	51.8	51.8	51.8	73.2	82.0	97.4	103	103	97.4	92.0	82.0	87.6
106	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	51.8	54.9	54.9	54.9	54.9	54.9	54.9	77.5	86.9	103	109	109	103	97.4	86.9	92.8
107	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	54.9	58.1	58.1	58.1	58.1	58.1	58.1	82.0	92.0	109	116	116	109	103	92.0	98.3
108	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	58.1	61.6	61.6	61.6	61.6	61.6	61.6	86.9	97.4	116	123	123	116	109	97.4	104
109	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	61.6	65.2	65.2	65.2	65.2	65.2	65.2	92.0	103	123	130	130	123	116	103	110
110	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	65.2	69.1	69.1	69.1	69.1	69.1	69.1	97.4	109	130	138	138	130	123	109	117
111	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	69.1	73.2	73.2	73.2	73.2	73.2	73.2	103	116	138	146	146	138	130	116	124
112	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	73.2	77.5	77.5	77.5	77.5	77.5	77.5	109	123	146	155	155	146	138	123	131
113	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	77.5	82.0	82.0	82.0	82.0	82.0	82.0	116	130	155	164	164	155	146	130	139
114	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	82.0	86.9	86.9	86.9	86.9	86.9	86.9	123	138	164	174	174	164	155	138	147
115	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	86.9	92.0	92.0	92.0	92.0	92.0	92.0	130	146	174	184	184	174	164	146	156
116	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	92.0	97.4	97.4	97.4	97.4	97.4	97.4	138	155	184	195	195	184	174	155	165
117	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	97.4	103	103	103	103	103	103	146	164	195	207	207	195	184	164	175
118	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	103	109	109	109	109	109	109	155	174	207	219	219	207	195	174	185
119	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	109	116	116	116	116	116	116	164	184	219	232	232	219	207	184	196
120	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	116	123	123	123	123	123	123	174	195	232	246	246	232	219	195	208
121	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	123	130	130	130	130	130	130	184	207	246	261	261	246	232	207	220
122	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	130	138	138	138	138	138	138	195	219	261	276	276	261	246	219	233
123	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	138	146	146	146	146	146	146	207	232	276	293	293	276	261	232	247
124	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	146	155	155	155	155	155	155	219	246	293	311	311	293	276	246	262
125	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	155	164	164	164	164	164	164	232	261	311	329	329	311	293	261	277
126	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	164	174	174	174	174	174	174	246	276	329	349	349	329	311	276	293
127	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	174	184	184	184	184	184	184	261	293	349	369	369	349	329	293	311
128	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	184	195	195	195	195	195	195	276	311	369	391	391	369	349	311	330
129	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	195	207	207	207	207	207	207	293	329	391	414	414	391	369	329	349
130	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	207	219	219	219	219	219	219	311	349	414	439	439	414	391	349	370
131	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	219	232	232	232	232	232	232	329	369	439	466	466	439	414	369	392
132	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	232	246	246	246	246	246	246	349	391	466	493	493	466	439	391	415
133	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	246	261	261	261	261	261	261	370	414	493	523	523	493	466	414	440
134	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	261	277	277	277	277	277	277	392	439	523	554	554	523	493	439	466
135	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	277	293	293	293	293	293	293	415	466	554	587	587	554	523	466	494
136	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	293	311	311	311	311	311	311	440	493	587	622	622	587	554	493	523
137	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	311	329	329	329	329	329	329	466	523	622	659	659	622	587	523	554
138	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	329	349	349	349	349	349	349	494	554	659	698	698	659	622	554	587
139	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	349	369	369	369	369	369	369	523	587	698	739	739	698	659	587	622
140	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	369	391	391	391	391	391	391	554	622	739	783	783	739	698	622	659
141	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	391	414	414	414	414	414	414	587	659	783	830	830	783	739	659	698
142	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	414	439	439	439	439	439	439	622	698	830	880	880	830	783	698	739
143	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	439	466	466	466	466	466	466	659	739	880	932	932	880	830	739	783
144	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	466	493	493	493	493	493	493	698	783	932	987	987	932	880	783	830
145	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	493	523	523	523	523	523	523	739	830	987	1046	1046	987	932	830	880
146	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	523	554	554	554	554	554	554	783	880	1046	1108	1108	1046	987	880	932
147	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	554	587	587	587	587	587	587	830	932	1108	1174	1174	1108	1046	932	987
148	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	587	622	622	622	622	622	622	880	987	1174	1244	1244	1174	1108	987	1046
149	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	622	659	659	659	659	659	659	932	1046	1244	1318	1318	1244	1174	1046	1108
150	1.41	1.02	1.00	1.00	1.00	1.00	1.00	1.00	659	698	698	698	698	698	698	987	1108	1318	1396	1396	1318	1244	1108	1174

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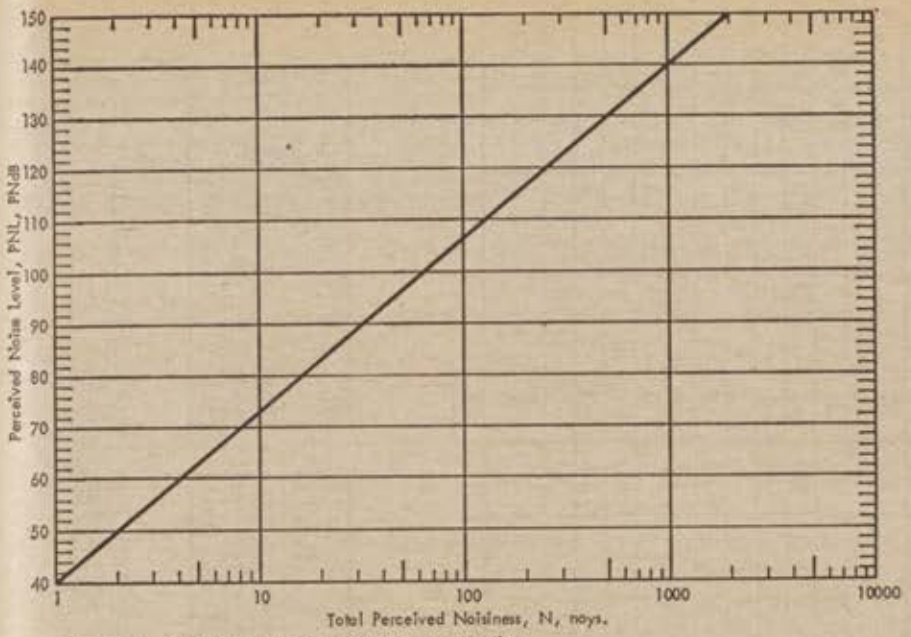


Figure B1. Perceived Noise Level as a Function of Noys.

Section B36.3 *Correction for spectral irregularities.* Noise having pronounced irregularities in the spectrum (for example, discrete frequency components or tones), must be adjusted by the correction factor C(k) calculated as follows:

Step 1. Starting with the corrected sound pressure level in the 80 Hz one-third octave band (band number 3), calculate the changes in sound pressure level (or "slopes") in the remainder of the one-third octave bands as follows:

$$s(3,k) = \text{no value}$$
$$s(4,k) = SPL(4,k) - SPL(3,k)$$
$$\vdots$$
$$s(i,k) = SPL(i,k) - SPL[(i-1),k]$$
$$\vdots$$
$$s(24,k) = SPL(24,k) - SPL(23,k)$$

Step 2. Encircle the value of the slope, s(i,k), where the absolute value of the change in slope is greater than 5; that is, where

$$|\Delta s(i,k)| = |s(i,k) - s[(i-1),k]| > 5.$$

Step 3. (a) If the encircled value of the slope s(i,k) is positive and algebraically greater than the slope s[(i−1),k], encircle SPL(i,k).

(b) If the encircled value of the slope s(i,k) is zero or negative and the slope s[i−1),k] is positive, encircle (SPL[(i−1),k])

(c) For all other cases, no sound pressure level value is to be encircled.

Step 4. Omit all SPL(i,k) encircled in Step 3 and compute new sound pressure levels SPL'(i,k) as follows:

(a) For nonencircled sound pressure levels, let the new sound pressure levels equal the original sound pressure levels,

$$SPL'(i,k) = SPL(i,k)$$

(b) For encircled sound pressure levels in bands 1–23, let the new sound pressure level equal the arithmetic average of the preceding and following sound pressure levels,

$$SPL'(i,k) = (\tfrac{1}{2})[SPL[(i-1),k] + SPL[(i+1),k]]$$

(c) If the sound pressure level in the highest frequency band (i=24) is encircled, let the new sound pressure level in that band equal

$$SPL'(24,k) = SPL(23,k) + s(23,k).$$

Step 5. Recompute new slopes s' (i,k), including one for an imaginary 25-th band, as follows:

$$s'(3,k) = s'(4,k)$$
$$s'(4,k) = SPL'(4,k) - SPL'(3,k)$$
$$\vdots$$
$$s'(i,k) = SPL'(i,k) - SPL'[(i-1),k]$$
$$\vdots$$
$$s'(24,k) = SPL'(24,k) - SPL'(23,k)$$
$$s'(25,k) = s'(24,k)$$

Step 6. For i from 3 to 23, compute the arithmetic average of the three adjacent slopes as follows:

$$\bar{s}(i,k) = (1/3)[s'(i,k) + s'[(i+1),k] + s'[(i+2),k]]$$

Step 7. Compute final adjusted one-third octave-band sound pressure levels, SPL'' (i,k), by beginning with band number 3 and proceeding to band number 24 as follows:

$$SPL''(3,k) = SPL(3,k)$$
$$SPL''(4,k) = SPL''(3,k) + \bar{s}(3,k)$$
$$\vdots$$
$$SPL''(i,k) = SPL''[(i-1),k] + \bar{s}[(i-1),k]$$
$$\vdots$$
$$SPL''(24,k) = SPL''(23,k) + \bar{s}(23,k)$$

Step 8. Calculate the differences, F(i,k), between the original and the adjusted sound pressure levels as follows:

$$F(i,k) = SPL(i,k) - SPL''(i,k)$$

and note only values greater than zero.

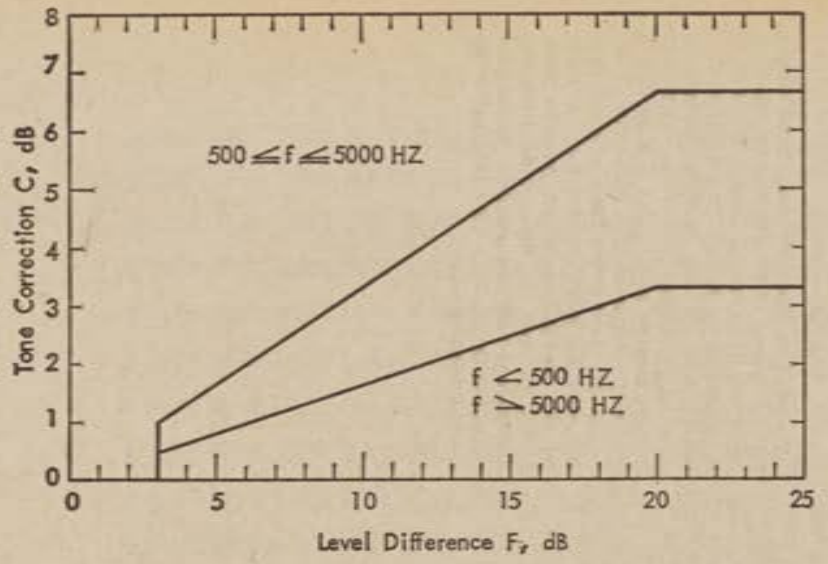
Step 9. For each of the 24 one-third octave bands, determine tone correction factors from the sound pressure level differences F(i,k) and Table B2.

Step 10. Designate the largest of the tone correction factors, determined in Step 9, as C(k). An example of the tone correction procedure is given in Table B3.

Tone corrected perceived noise levels PNLT(k) are determined by adding the C(k) values to corresponding PNL(k) values, that is,

$$PNLT(k) = PNL(k) + C(k)$$

For any i-th one-third octave band, at any k-th increment of time, for which the tone correction factor is suspected to result from something other than (or in addition to) an actual tone (or any spectral irregularity other than aircraft noise), an additional analysis may be made using a filter with a bandwidth narrower than one-third of an octave. If the narrow band analysis corroborates that suspicion, then a revised value for the background sound pressure level, SPL''(i,k), may be determined from the analysis and used to compute a revised tone correction factor, F(i,k), for that particular one-third octave band.



Frequency f, HZ	Level Difference F, dB	Tone Correction C, dB
50 ≤ f < 500	F < 3 3 ≤ F < 20 20 ≤ F	0 F/6 3 1/3
500 ≤ f ≤ 5000	F < 3 3 ≤ F < 20 20 ≤ F	0 F/3 6 2/3
5000 < f ≤ 10000	F < 3 3 ≤ F < 20 20 ≤ F	0 F/6 3 1/3

Table B2.. Tone Correction Factors

① Band (i)	② f HZ	③ SPL dB	④ S dB Step 1	⑤ |ΔS| dB Step 2	⑥ SPL' dB Step 4	⑦ S' dB Step 5	⑧ $\overline{S}$ dB Step 6	⑨ SPL'' dB Step 7	⑩ F dB Step 8	⑪ C, dB Step 9
1	50	-	-	-	-	-	-	-	-	-
2	63	-	-	-	-	-	-	-	-	-
3	80	70	-	-	70	-8	-2 1/3	70	-	
4	100	62	- 8	-	62	-8	+3 1/3	67 2/3	-	
5	125	(70)	+(8)	16	71	+9	+6 2/3	71	-	
6	160	80	+10	2	80	+9	+2 2/3	77 2/3	2 1/3	
7	200	82	+(2)	8	82	+2	-1 1/3	80 1/3	1 2/3	
8	250	(83)	+ 1	1	79	-3	-1 1/3	79	4	2/3
9	315	76	-(7)	8	76	-3	+ 1/3	77 2/3	-	
10	400	(80)	+(4)	11	78	+2	+1	78	2	
11	500	80	0	4	80	+2	0	79	1	
12	630	79	- 1	1	79	-1	0	79	-	
13	800	78	- 1	0	78	-1	- 1/3	79	-	
14	1000	80	+ 2	3	80	+2	- 2/3	78 2/3	1 1/3	
15	1250	78	- 2	4	78	-2	- 1/3	78	-	
16	1600	76	- 2	0	76	-2	+ 1/3	77 2/3	-	
17	2000	79	+ 3	5	79	+3	+1	78	1	
18	2500	(85)	+ 6	3	79	0	- 1/3	79	6	[2]
19	3150	79	-(6)	12	79	0	-2 2/3	78 2/3	1/3	
20	4000	78	- 1	5	78	-1	-6 1/3	76	2	
21	5000	71	-(7)	6	71	-7	-8	69 2/3	1 1/3	
22	6300	60	-11	4	60	-11	-8 2/3	61 2/3	-	
23	8000	54	- 6	5	54	-6	-8	53	1	0
24	10000	45	- 9	3	45	-9	-	45	-	
						-9				

Step 1	③(i) - ③(i-1)
Step 2	|④(i) - ④(i-1)|
Step 3	see instructions
Step 4	see instructions
Step 5	⑥(i) - ⑥(i-1)

Step 6	[⑦(i) + ⑦(i+1) + ⑦(i+2)] ÷ 3
Step 7	⑨(i-1) + ⑧(i-1)
Step 8	③(i) - ⑨(i)
Step 9	see Table B2

Table B3. Example of Tone Correction Calculation for a Turbofan Engine

Section B36.4 *Maximum tone corrected perceived noise level.* The maximum tone corrected perceived noise level, PNLTM, is the maximum calculated value of the tone corrected perceived noise level, PNLT(k), calculated in accordance with the procedure of § B36.3 of this Appendix. Figure B2 is an example of a flyover noise time history where the maximum value is clearly indicated. Half-second time intervals, Δt, are small enough to obtain a satisfactory noise time history.

If there are no pronounced irregularities in the spectrum, then the procedure of § B36.3 of this Appendix would be redundant since PNLT(k) would be identically equal to PNL(k). For this case, PNLTM would be the maximum value of PNL(k) and would equal PNLM.

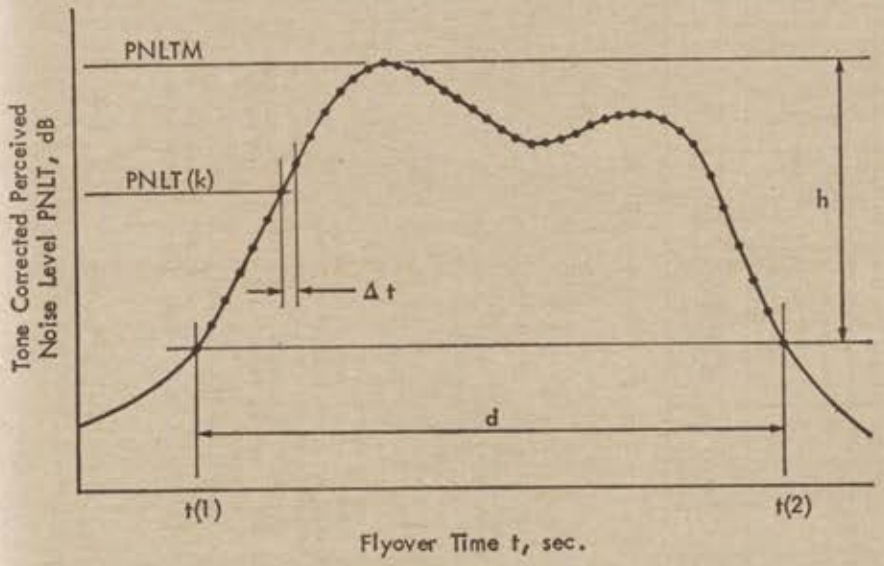


Figure B2. Example of Perceived Noise Level Corrected for Tones as a Function of Aircraft Flyover Time

Section B36.5 *Duration correction.* The duration correction factor D is determined by the integration technique defined by the expression:

$$D=10\log\left[(1/T)\int_{t(1)}^{t(2)}\text{ant}\,[PNLT/10]\,dt\right]-PNLTM$$

where T is a normalizing time constant, PNLTM is the maximum value of PNLT, and t(1) and t(2) are the limits of the significant noise time history.

Since PNLT is calculated from measured values of SPL, there will, in general, be no obvious equation for PNLT as a function of time. Consequently, the equation can be rewritten with a summation sign instead of an integral sign as follows:

$$D=10\log\left[(1/T)\sum_{k=0}^{d/\Delta t}\Delta t\,\text{ant}\,[PNLT(k)/10]\right]-PNLTM$$

where Δt is the length of the equal increments of time for which PNLT(k) is calculated and d is the time interval to the nearest 1.0 second during which PNLT(k) is within a specified value, h, of PNLTM.

Half-second time intervals for Δt are small enough to obtain a satisfactory history of the perceived noise level. A shorter time interval may be selected by the applicant provided aproved limits and constants are used.

The following values for T, Δt, and h, must be used in calculating D:

$$T=10\text{ sec},$$
$$\Delta t=0.5\text{ sec, and}$$
$$h=10\text{ dB}.$$

Using the above values, the equation for D becomes

$$D=10\log\left[\sum_{k=0}^{2d}\text{ant}\,[PNLT(k)/10]\right]-PNLTM-13$$

where the integer d is the duration time defined by the points that are 10 dB less than PNLTM.

If the 10 dB-down points fall between calculated PNLT(k) values (the usual case), the applicable limits for the duration time must be chosen from the PNLT(k) values closest to PNLTM−10. For those cases with more than one peak value of PNLT(k), the applicable limits must be chosen to yield the largest possible value for the duration time.

If the value of PNLT(k) at the 10 dB-down points is 90 PNdB or less, the value of d may be taken as the time interval between the initial and the final times for which PNLT(k) equals 90 PNdB.

Section B36.6 *Effective perceived noise level.* The total subjective effect of an aircraft flyover is designated "effective perceived noise level," EPNL, and is equal to the algebraic sum of the maximum value of the tone corrected perceived noise level, PNLTM, and the duration correction, D. That is,

$$EPNL=PNLTM+D$$

where PNLTM and D are calculated under §§ B36.4 and B36.5 of this appendix.

The above equation can be rewritten by substituting the equation for D from § B36.5 of this appendix, that is,

$$EPNL=10\log\left[\sum_{k=0}^{2d}\text{ant}\,[PNLT(k)/10]\right]-13$$

Section B36.7 *Mathematical formulation of noy tables.* The relationship between sound pressure level and perceived noisiness given in Table B1 is illustrated in Figure B3. The variation of SPL with log n for a given one-third octave band can be expressed by either one or two straight lines depending upon the frequency range. Figure B3(a) illustrates the double line case for frequencies below 400 Hz, and above 6,300 Hz and Figure B3(b) illustrates the single line case for all other frequencies.

The important aspects of the mathematical formulation are:

1. the slopes of the straight lines, p(b) and p(c),
2. the intercepts of the lines on the SPL-axis, SPL(b), and SPL(c), and
3. the coordinates of the discontinuity, SPL(a), and log n(a).

The equations are as follows:

Case 1. Figure B3(a), f <400 Hz.
f >6300 Hz.

$$SPL(a)=\frac{p(c)SPL(b)-p(b)SPL(c)}{p(c)-p(b)}$$

$$\log n(a)=\frac{SPL(c)-SPL(b)}{p(b)-p(c)}$$

(a) $SPL(b)\leq SPL\leq SPL(a)$.

$$n=\text{ant}\frac{SPL-SPL(b)}{p(b)}$$

(b) $SPL\geq SPL(a)$.

$$n=\text{ant}\frac{SPL-SPL(c)}{p(c)}$$

(c) $0\leq\log n\leq\log n(a)$.

$$SPL=p(b)\log n+SPL(b)$$

(d) $\log n\geq\log n(a)$.

$$SPL=p(c)\log n+SPL(c)$$

Case 2. Figure B3(b), $400\leq f\leq 6300$ Hz.

(a) $SPL\geq SPL(c)$.

$$n=\text{ant}\frac{SPL-SPL(c)}{p(c)}$$

(b) $\log n\geq 0$.

$$SPL=p(c)\log n+SPL(c)$$

Let the reciprocals of the slopes be defined as,

$$M(b)=1/p(b)$$
$$M(c)=1/p(c)$$

Then the equations can be written,

Case 1. Figure B3(a), f<400 Hz.
f>6300 Hz.

$$SPL(a)=\frac{M(b)SPL(b)-M(c)SPL(c)}{M(b)-M(c)}$$

$$\log n(a)=\frac{M(b)M(c)[SPL(c)-SPL(b)]}{M(c)-M(b)}$$

(a) $SPL(b)\leq SPL\leq SPL(a)$.
$n=\text{ant}\,M(b)[SPL-SPL(b)]$

(b) $SPL\geq SPL(a)$.
$n=\text{ant}\,M(c)[SPL-SPL(c)]$

(c) $0\leq\log n\leq\log n(a)$.

$$SPL=\frac{\log n}{M(b)}+SPL(b)$$

(d) $\log n\geq\log n(a)$.

$$SPL=\frac{\log n}{M(c)}+SPL(c)$$

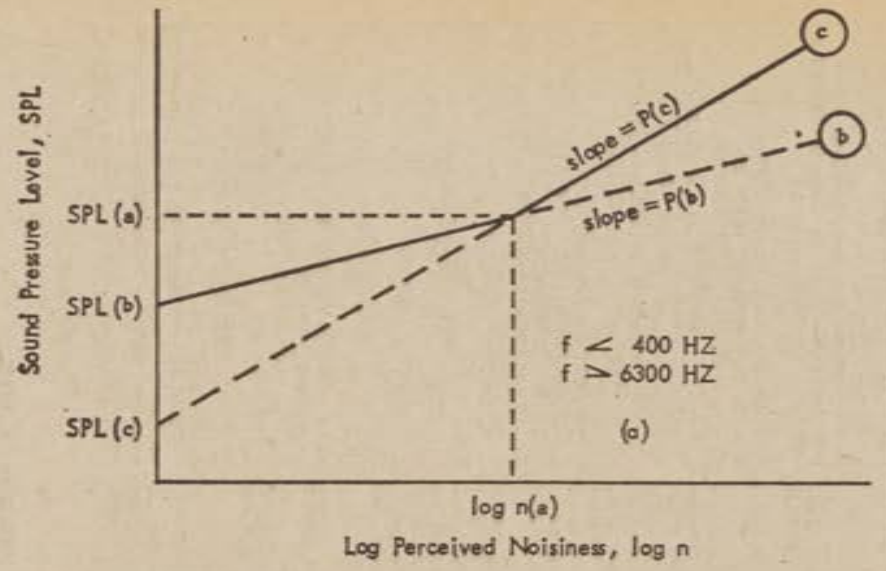
Case 2. Figure B3(b), $400\leq f\leq 6300$ Hz.

(a) $SPL\geq SPL(c)$.
$n=\text{ant}\,M(c)[SPL-SPL(c)]$

(b) $\log n\geq 0$.

$$SPL=\frac{\log n}{M(c)}+SPL(c)$$

Table B4 lists the values of the important constants necessary to calculate sound pressure level as a function of perceived noisiness.



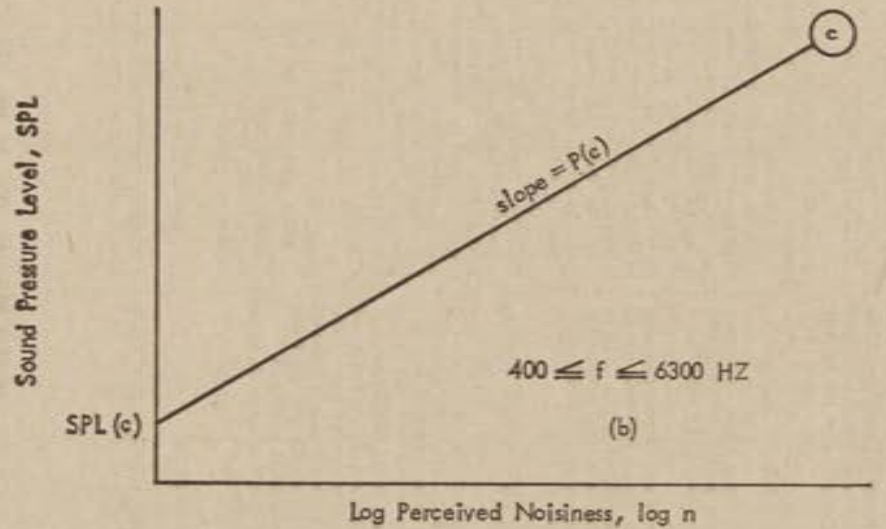


Figure B3. Sound Pressure Level as a Function of Noys.

Band (i)	f HZ	M(b)	SPL (b) dB	SPL (a) dB	M(c)	SPL (c) dB
1	50	0.043478	64	91.0	0.030103	52
2	63	0.040570	60	85.9	"	51
3	80	0.036831	56	87.3	"	49
4	100	"	53	79.9	"	47
5	125	0.035336	51	79.8	"	46
6	160	0.033333	48	76.0	"	45
7	200	"	46	74.0	"	43
8	250	0.032051	44	74.9	"	42
9	315	0.030675	42	94.6	"	41
10	400	-	-	-	"	40
11	500	-	-	-	"	"
12	630	-	-	-	"	"
13	800	-	-	-	"	"
14	1000	-	-	-	"	"
15	1250	-	-	-	"	38
16	1600	-	-	-	0.029960	34
17	2000	-	-	-	"	32
18	2500	-	-	-	"	30
19	3150	-	-	-	"	29
20	4000	-	-	-	"	"
21	5000	-	-	-	"	30
22	6300	-	-	-	"	31
23	8000	0.042285	37	44.3	"	34
24	10000	"	41	50.7	"	37

Table B4. Constants for Mathematically Formulated NOY Values

APPENDIX C—NOISE LEVELS FOR SUBSONIC TRANSPORT CATEGORY AND TURBOJET POWERED AIRPLANES UNDER § 36.201

Section C36.1 *Noise measurement and evaluation.* Compliance with this appendix must be shown with noise levels measured and evaluated as prescribed, respectively, by Appendix A and Appendix B of this part, or under approved equivalent procedures.

Section C36.3 *Noise measuring points.* Compliance with the noise level standards of § C36.5 must be shown—

(a) For takeoff, at a point 3.5 nautical miles from the start of the takeoff roll on the extended centerline of the runway;

(b) For approach, at a point 1 nautical mile from the threshold on the extended centerline of the runway; and

(c) For the sideline, at the point, on a line parallel to and 0.25 nautical miles from the extended centerline of the runway, where the noise level after liftoff is greatest, except that, for airplanes powered by more than three turbojet engines, this distance must be 0.35 nautical miles.

Section C36.5 *Noise levels*—(a) *General.* Except as provided in paragraphs (b) and (c) of this section, it must be shown by flight test that the noise levels of the airplane, at the measuring points prescribed in § 36.3, do not exceed the following (with appropriate interpolation between weights):

(1) For approach and sideline, 108 EPNdB for maximum weights of 600,000 pounds or more, less 2 EPNdB per halving of the 600,000-pound maximum weight down to 102 EPNdB for maximum weights of 75,000 pounds and under.

(2) For takeoff, 108 EPNdB for maximum weights of 600,000 pounds or more, less 5 EPNdB per halving of the 600,000-pound maximum weight down to 93 EPNdB for maximum weights of 75,000 pounds and under.

(b) *Tradeoff.* The noise levels in paragraph (a) may be exceeded at one or two of the measuring points prescribed in § C36.3, if—

(1) The sum of the exceedances is not greater than 3 EPNdB;

(2) No exceedance is greater than 2 EPNdB; and

(3) The exceedances are completely offset by reductions at other required measuring points.

(c) *Prior applications.* For applications made before December 1, 1969, for airplanes powered by more than three turbojet engines with bypass ratios of two or more, the value prescribed in paragraph (b)(1) of this section may not exceed 5 EPNdB and the value prescribed in paragraph (b)(2) of this section may not exceed 3 EPNdB.

Section C36.7 *Takeoff test conditions.* (a) This section applies to all takeoffs conducted in showing compliance with this part.

(b) Takeoff power or thrust must be used from the start of the takeoff to the point at which an altitude of at least 1,000 feet above the runway is reached, except that, for airplanes powered by more than three turbojet engines, this altitude must not be less than 700 feet.

(c) Upon reaching the altitude specified in paragraph (b) of this section, the power or thrust may not be reduced below that power or thrust that will provide level flight with one engine inoperative, or below that power or thrust that will maintain a climb gradient of at least 4 percent, whichever power or thrust is greater.

(d) A speed of at least V_2+10 knots must be attained as soon as practicable after lift-off, and must be maintained throughout the takeoff noise test.

(e) A constant takeoff configuration, selected by the applicant, must be maintained throughout the takeoff noise test.

Section C36.9 *Approach test conditions.* (a) This section applies to all approaches conducted in showing compliance with this part.

(b) The airplane's configuration must be that specified by the applicant.

(c) The approaches must be conducted with a steady glide angle of $3°\pm0.5°$ and must be continued to a normal touchdown with no airframe configuration change.

(d) A steady approach speed of not less than 1.30 V_s+10 knots must be established and maintained over the approach measuring point.

(e) All engines must be operating at approximately the same power or thrust, and must be operating at not less than the power or thrust required for the maximum allowable flap setting.

[F.R. Doc. 69-13368; Filed, Nov. 17, 1969; 9:08 a.m.]

[Docket No. 9958; Amdt. 39-877]

PART 39—AIRWORTHINESS DIRECTIVES

Aer Pegaso Model M.100S and C.A.R.M.A.M. Model M.200 Gliders

There have been reports of improper installation of the horizontal stabilizer on the Aer Pegaso Model M.100S and C.A.R.M.A.M. Model M.200 gliders which caused improper engagement of the elevator "quick disconnect" attachment. In view of the seriousness of such a condition, and the likelihood that such a condition may exist or develop in other gliders of the same type design, an airworthiness directive (AD) is being issued to require installation of a means to permit visual confirmation of proper engagement and the installation of a placard to require visual confirmation of the engagement before the first flight after each installation of the horizontal stabilizer.

Since a situation exists that requires immediate adoption of this regulation, it is found that notice and public procedure are impracticable and good cause exists for making this amendment effective in less than 30 days.

In consideration of the foregoing, and pursuant to the authority delegated to me by the Administrator (14 CFR 11.89) § 39.13 of Part 39 of the Federal Aviation Regulations is amended by adding the following new airworthiness directive:

AER PEGASO C.A.R.M.A.M. Applies to Aer-Pegaso Model M.100S and C.A.R.M.A.M. Model M.200 gliders.

Compliance is required within the next 25 hours' time in service after the effective date of this AD, unless already accomplished.

To detect improper installation of the horizontal stabilizer to the glider, accomplish the following:

(a) Install an inspection window on the left side of the dorsal fin to allow visual confirmation of the elevator "quick disconnect" attachment and paint the two plates of the elevator control transmission fork in accordance with Aer-Pegaso Technical Bulletin N.10/M-100S, dated September 26, 1969, or an FAA-approved equivalent.

(b) Install the following placard in the cockpit in clear view of the pilot:

"Before the first flight after rigging the tailplane to the fuselage, look through the inspection window located on the left side of the dorsal fin and visually confirm that the end (ball bearing) of the elevator control lever is correctly engaged in the corresponding fork of the elevator control transmission. To do this, it may be necessary to move the control stick in the longitudinal direction in order to bring the lever end into view through the window. If the rigging is correct, the ball bearing will appear between the fork sides."

This amendment becomes effective November 23, 1969.

(Sec. 313(a), 601, 603, Federal Aviation Act of 1958, 49 U.S.C. 1354(a), 1421, 1423; sec. 6(c), Department of Transportation Act, 49 U.S.C. 1655(c))

Issued in Washington, D.C., on November 10, 1969.

R. S. SLIFF,
Acting Director,
Flight Standards Service.

[F.R. Doc. 69-13659; Filed, Nov. 17, 1969; 8:46 a.m.]

SUBCHAPTER E—AIRSPACE

[Airspace Docket No. 69-WE-79]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS

Alteration of Control Zone

The purpose of this amendment to Part 71 of the Federal Aviation Regulations is to alter the time of designation of the Santa Rosa, Calif., control zone.

The Santa Rosa control zone is presently designated from 0600 to 2200 hours local time daily. Due to changes in aircraft activity, the hours of operation of the Santa Rosa Tower will be changed to 0700 to 2300 hours local time daily. Therefore, action is taken herein to redesignate the effective hours of the Santa Rosa control zone coincident with those of the control tower.

Since this amendment is minor in nature, notice and public procedure hereon are unnecessary.

In consideration of the foregoing, Part 71 of the Federal Aviation Regulations is amended as hereinafter set forth.

In § 71.171 (34 F.R. 4557) the Santa Rosa, Calif., control zone is amended by deleting "* * * 0600 to 2200 hours * * *" and substituting "* * * 0700 to 2300 hours * * *" therefor.

Effective date. This amendment shall be effective 0901 G.m.t., December 11, 1969.

Issued in Los Angeles, Calif., on November 4, 1969.

LEE E. WARREN,
Acting Director, Western Region.

[F.R. Doc. 69-13660; Filed, Nov. 17, 1969; 8:46 a.m.]

[Airspace Docket No. 69-CE-106]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS

Alteration of Transition Area

The purpose of this amendment to Part 71 of the Federal Aviation Regulations is to alter the Wolf Point, Mont., transition area.

The Wolf Point Airport, Wolf Point, Mont., has been renamed Wolf Point International Airport. Therefore, it is necessary to alter the Wolf Point transition area which presently refers to the airport as Wolf Point Airport to reflect the airport change of name. Action is taken herein to reflect this change.

Since this change is minor in nature and imposes no additional burden on any person, notice and public procedure hereon are unnecessary.

In consideration of the foregoing, Part 71 of the Federal Aviation Regulations is amended effective immediately as hereinafter set forth:

In § 71.181 (34 F.R. 4637), the Wolf Point, Mont., transition area is altered by deleting "Wolf Point Airport" in the text and substituting therefor "Wolf Point International Airport".

(Sec. 307(a), Federal Aviation Act of 1958, 49 U.S.C. 1348; sec. 6(c), Department of Transportation Act, 49 U.S.C. 1655(c))

Issued in Kansas City, Mo., on October 22, 1969.

ROBERT I. GALE,
Acting Director, Central Region.

[F.R. Doc. 69-13661; Filed, Nov. 17, 1969; 8:46 a.m.]

[Airspace Docket No. 69-WE-65]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS

Designation of Transition Area

On September 20, 1969, a notice of proposed rule making was published in the